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THE POSSIBILITIES OF CURING ADVANCED LARYNGEAL TUBERCULOSIS.*

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NEW YORK.

The subject which we are to discuss this evening is such a broad one that you will permit me to take up only a few of the salient points—in other words, the problem of combatting certain of the most distressing and serious symptoms of laryngeal tuberculosis. To start with, let me remind you that not more than perhaps twenty-five years ago even some laryngologists discussed the question whether or not it was worth while to treat patients afflicted with laryngeal tuberculosis. In my early days in the Montefiore Hospital one of the directors asked me in all seriousness: "Doctor, why do you not let these poor devils die without bothering them?"

*Read before the American Laryngological, Rhinological and Otological Society at its annual meeting, held June 2, 3 and 4, 1920.

Well, in spite of this attitude we continued our efforts. Very soon I was able to publish from this same hospital an article in which I asserted the possibility of curing incipient laryngeal tuberculosis. That was after Hermann Krause, Heryng and Moritz Schmidt had come out with similar statements and a plea for energetic treatment in such cases.

Today I venture to say that it is possible to cure even advanced laryngeal tuberculosis, and in many cases independent of the condition of the lungs. I am well aware that Prof. Friedrich of Kiel expressed the general belief when he stated last year that advanced cases of laryngeal tuberculosis can be improved by local treatment, their curability, however, depending upon the gravity of the pulmonary lesions. Nevertheless, my experience with this disease extending over twenty-five years in the Montefiore Hospital alone, during which time I not only saw, but personally treated hundreds of cases annually, warrants my making such a statement. In order to prove my contention let us consider the three principal symptoms and the means nowadays at our disposal to combat them. They are: (1) Cough, (2) dysphagia and (3) stenosis of the larynx.

THE COUGH.

You know very well, gentlemen, that cough may originate in any part of the respiratory tract. As laryngologists it is certainly our duty to remove cough originating in the upper air tract, and it is in this connection that the work of the specialist may and should be of great prophylactic and curative value.

(a) Nasal Cough.—That nasal polypi, an affection seldom met with in tuberculosis, often cause a reflex cough is too well known to be discussed further. Their removal is easy and not complicated by great loss of blood.

Indirectly, cough may be caused by a deviated nasal septum —i. e., when secretions stagnate behind the deviation and then run down into the throat. If the general condition of the patient is at all satisfactory, he should be operated on under cocain and adrenalin (no general anesthesia). I recollect a young man whose septum was extremely deflected. The operation not only gave him nasal breathing, but also ventilation

of the affected side of the lung, so that within a few months he gained twenty pounds and left the institution in a much improved condition.

In the case of accessory sinus affection, minor operations may be attempted, if general conditions permit and if there is a good chance of thus curing the sinus trouble. But one should hesitate very much before attempting a radical operation, as for example, on the frontal sinus, etc.

(b) The Pharyngeal Cough.—This is by far the most important cough from a prophylactic as well as a curative point of view. If the internist would only pay more attention to the details set forth here, the percentage of cured pulmonary cases would increase materially.

It is in the pharynx that the most frequent source of a cough is found, and one that can be removed easily in the majority of cases by regular topical applications. We find here postnasal catarrh, with its sticky, tenacious secretion, often originating in the accessory sinuses, and also granulations and diseased tonsils. In catarrhal cases mild applications several times a week will positively remove the cough. These are the typical cases, where characteristic hacking cough is found, and with but a few slight rales over the lungs. Nobody could ever convince me that these few rales have any connection with the cough. Morphin will do great harm in this stage, but rational treatment of the pharynx will eliminate the great danger of a permanent cough.

The treatment of a granular pharyngitis offers no special difficulties, but how about tonsils? The writer has warned against the indiscriminate removal of tonsils in general,[1] and here he wishes to protest strongly against operations on them in tuberculous patients. In incipient cases and in young children, when the tonsils may cause difficulty in respiration, they may be removed. But when this is not the case and the tonsils are only chronically affected, with or without cheesy matter in their crypts, their removal is contraindicated. I know of too many cases that "went wrong" after tonsillectomy that I should ignore them. Patients coming into a tuberculosis ward nowadays seldom have any tonsils left. Three examples will serve to illustrate this.

Case 1.—Mrs. ———, a woman with advanced pulmonary and laryngeal tuberculosis and marked dysphagia, had been treated by me with the result that she could swallow food, something she had not been able to do for a long time previously. I sent her to the country, and her physician at once transferred her to a hospital for tonsillectomy. Soon I received a telegram from her husband: "Tonsils removed successfully." Three days later she was dead—hemorrhage from the lungs.

Case 2.—Miss F., a delicate young woman, suffering from mild laryngeal and pulmonary tuberculosis, was referred by me to a laryngologist in the South. He discovered "big" tonsils and removed them without consulting me. This, too, was done "successfully." Within four weeks, however, a new eruption of miliary tubercles appeared in the pharynx, and such "secondary eruptions invariably give a bad prognosis," the doctor wrote. A few months later she was dead. I do not affirm that she would not have died within that period, but I am strongly inclined to believe that she would have had a greater chance to recover if tonsillectomy had been avoided, and that the secondary eruption was directly the result of the operation.

Case 3.—Miss G. was treated by me on and off for recurrent laryngitis. I examined her frequently and always found the same suspicious area over the left lung, without, however, being able to make a positive diagnosis of tuberculosis. During the summer months she invariably went to the mountains or the seashore, and kept quite well with the aid of a little occasional treatment. Finally she consulted another physician and out came her tonsils. Exactly two months afterwards she returned to me with distinct signs of tuberculosis over both lungs. Her larynx was also affected: interarytenoid edematous swelling and ulcer on the left vocal cord. About four weeks later a miliary eruption appeared all over the right tonsillar region that showed thick tuberculous infiltration. Both conditions are rapidly progressing, and there is little hope of her recovery. (She has died since.)

Such cases make one doubt the wisdom of tonsillectomy and advocate conservative means for the treatment of diseased tonsils.

The hypertrophied lingual tonsil, which is encountered so very frequently in the tuberculous, is best treated by the galvanocautery method. The same applies to enlarged veins at the base of the tongue, which not infrequently are the only source of a "pulmonary" hemorrhage.

The cough due to pathologic conditions in the larynx and trachea will best be dealt with in connection with the second symptom under consideration, viz.:

DYSPHAGIA.

Much more important than the relief of cough is the difficult task of ameliorating or entirely removing dysphagia. On this point hinges the success or failure of the treatment, the life or death of the patient. That, according to my estimate, holds good for about 80 per cent of the advanced laryngeal cases.

Since the cure of general tuberculosis is largely a matter of dietetics, this becomes illusory when the patient has difficulty in swallowing, a symptom that increases in gravity pari passu with the advance of the laryngeal lesion. The nearer the latter is located to the entrance of the larynx the greater the pain. There is an elastic ring that comprises the epiglottis, the ventricular bands, the plicæ aryepiglotticæ and the arytenoids, and this ring, as is well known, contracts each time food passes over the entrance of the larynx and explains the pain during eating.

What, then, are the means to combat this symptom? Although dysphagia is generally the sign of advanced laryngeal tuberculosis, one ought to begin the treatment of the larynx at a very early stage if future trouble is to be avoided. Prophylaxis is the watchword here, and for that reason one ought to begin in the pretuberculous period, if such a thing were always possible. In these early stages one finds two conditions: a simple inflammatory laryngitis, and one that is nothing else but a continuance of a rhinopharyngeal catarrh. I agree here with Dr. Jiménez Encinas[2], of Madrid, in what he says about prophylactic measures and could add a good deal, if space permitted.

But it is in this socalled pretuberculous stage when the work of the "laryngoiater" is of importance also in discovering

latent and I must add primary laryngeal tuberculosis. (I found the word "laryngoiater" in an article by Poli of Genoa; most likely it is similar to our word pediater, etc.)

As to latent tuberculosis of the larynx, the writer encountered quite a number of such cases, and it so happened that a differential diagnosis had always to be established between carcinoma, lues and tuberculosis.

Case.—Mr. J. L. W., aged 30, consulted me on February 16, 1917, on the advice of a laryngologist of this city. He had been hoarse for the last eight months; had slight pain in the throat, but never any disphagia, denied any specific infection and had lost considerably in weight. Wassermann as well as sputum examination, both repeatedly done, were always negative. Larngeal examination revealed the following:

The epiglottis was punched out and showed scar tissue, evidently from former ulcerations. The left ventricular band was very much thickened (infiltrated), and on the same side anteriorly in the subglottic space there was also a small mass, apparently likewise a tuberculous infiltration. The right side could not be seen, as it was covered partly by the overhanging epiglottis and partly by the enlarged arytenoid (marked perichondritis). There was a mild stenosis of the larynx. At first I was inclined to consider this case as a mixed infection—the epiglottis especially looked like an old luetic infection, while the other parts appeared to be tuberculous—but after a while signs of pulmonary tuberculosis were recognized and the patient treated as such. By and by the epiglottic infiltration on the left side became smaller and the vocal cord was seen to be immobile. Under ordinary treatment patient improved to such an extent that he gained more than thirty pounds and felt perfectly well—that is, with the exception of the hoarseness. He had had no antisyphilitic treatment and the case was considered as one of latent laryngeal tuberculosis.

In other instances there may be a grave doubt in the mind of the most experienced laryngologist whether he has to deal with cancer or tuberculosis. Very rare are those cases in which evidence of both diseases or of cancer and lues is found or finally all three diseases combined. Of the last mentioned category the writer only lately saw a case in consultation with

a Newark colleague. As to the presence of luetic affection of the larynx, one should always bear in mind the possibility of pulmonary syphilis. As has been pointed out, it is not generally known that a premonitory bleeding from the lungs through a syphilide of its mucosa may and does occur. Thus a pulmonary hemorrhage with doubtful or slight signs over the lungs may mislead one to make a diagnosis of tuberculosis, while in reality it is a case of syphilis. A Wassermann test does not always clear up the situation.

As to primary tuberculosis of the larynx, the writer has demonstrated many such cases before medical societies during the last ten years. Here, too, occasionally a differential diagnosis has to be established. But when the laryngeal image is positively indicative of tuberculosis the patient must be treated accordingly, no matter what may be the verdict of the internist in regard to the lungs. In order to make this point perfectly clear, the writer would refer to the following instance: A case belonging to this class was presented by me to a medical society, when a well known phthiseotherapist got up and remarked approximately thus: "In such cases you are invariably able to show lesions in the lungs, and when you do not find any, it is positively not tuberculosis." I felt constrained to remind him of a case, in which I had made the diagnosis of primary laryngeal tuberculosis and which he himself had examined every four weeks. It was not until eight months later that he also found pulmonary lesions. This does not militate against his ability as a diagnostician. For how can anyone find tuberculosis if there is none? It does speak in favor of the theory of primary tuberculosis of the larynx.

A case similar to mine is published by Dr. J. Encinas (loc. cit., p. 251) in extenso. He adds that he has records of ten more such observations in his own practice. In all these cases the diagnosis of tuberculosis was verified by the internist a long time after it had been established by the laryngologist. All this only goes to prove that laryngologists have to believe in what they see. This is true of carcinoma and it is just as applicable to tuberculosis. Parenthetically it should be added that temperature, pulse and respiration never gave any evidence of the disease in Dr. Encinas' nor in my cases.

That tuberculosis may manifest itself exclusively in the larynx should not be surprising, since "local" tuberculosis is frequently observed in other organs as well, for example, the kidneys, etc. But even in our own specialty such cases are not unknown. Primary affections of the soft and hard palate, the pillars and the tongue have been noticed by a number of colleagues, as evidenced by a discussion in the Academia médico-chirurgica española (Revista española de laryngologia, p. 224, 119). Dr. Ledete has also described a convincing case of primary tuberculosis of the tongue (p. 235, ibidem). Fein of Vienna demonstrated before the Vienna Laryngological Society a case of primary tuberculosis of the pharyngeal tonsil. In the discussion that followed, by the way, Doctors Tschiassny and Hofer reported bad results after tonsillectomy in such cases. (Internat. Centralblatt für Laryng., p. 73, 1920.)

The cases cited and many others seen during the last twenty-five or thirty years have demonstrated to the writer the clinical evidence of a primary or local tuberculosis of the larynx (and pharynx); nor is he inclined to change his views in spite of Prof. Orth's opinion to the contrary. This illustrious pathologist of Berlin, who has devoted fifty years of his life to the study of tuberculosis, is very much astonished that some laryngologists still believe in a primary laryngeal tuberculosis. With all due respect to this great authority, it is my conviction that such cases not only occur, but occur more frequently than we ever believed they did. Of course, nobody can prove that there is not a small area somewhere in the lungs that could not be diagnosticated in any of these cases. But when we see that the larynx is positively tuberculous and that such lesions get well occasionally without being followed by a pulmonary affection, then we have to believe that Orth is correct when he states that an invasion of tubercle bacilli into the body does not necessarily mean an infection. (Berliner klin. Woch., p. 76, 1920.)

Permit me to add here a few words in regard to the origin of tuberculosis in the larynx. Many theories have been brought forward, the oldest and most important one being that by Louis, known generally as the theory of sputum infection. This was later taken up by the Schottelius of Freiburg, who ingeniously gave it what may be termed a mechanical

basis. According to Schottelius, the musculus interarytenoideus transversus is an important factor in the pathology of the larynx, especially in tuberculosis. Its contraction presses the blood into the large vessels of the submucosa and mucosa, which normally is folded at the posterior wall. A cough from any source, especially prolonged cough, will cause a hyperemia, followed by a thickening of the folds of the mucosa. Then the secretions will stagnate here and be decomposed. Thus an ulceration will be produced that may or may not be of tuberculous nature.

This theory will explain the origin of laryngeal tuberculosis in some cases, but not in all, and surely not that of primary laryngeal tuberculosis. In these the hematogenous or lymphogenous mode of infection is the prevalent one.[3] The latter road—i. e., by way of the lymphatics, is especially plausible, if the retropharynx is taken into consideration. Those who have read the writer's article on the etiology of pulmonary tuberculosis[4] will remember that the postnasal space, the vault of the pharynx, was considered the locus minimæ resistentiæ, the place through which in many instances the tubercle bacillus finds entrance into the system, an opinion corroborated by years of observation afterwards. This holds good, not only for tuberculosis, but for many other infections as well. I need mention only cerebrospinal meningitis, influenza, etc. During the last epidemic of influenza a system of keeping or making the nasopharynx "sterile" was devised, a most sensible measure, if carefully carried out. The rapidity of absorption of toxins from the posterior nares and nasopharynx is easily explained by the abundance of lymphatics, the scarcity of protecting connective tissues and finally by the extraordinarily great frequency of a postnasal catarrh. Thus it is a well known fact that in nasopharyngeal diphtheria, for example, the danger is from toxemia. This danger is much less when the tonsils are affected, even when they show abundant membranes.[5] Now if we consider, as the writer has always done, that the nasopharynx is the most important gateway for the entrance of tubercle bacillus, it is not difficult to understand how primary tuberculosis of the larynx can be produced by way of the lymphatics. It is surprising that it does not occur more frequently.

But be this as it may, one thing is sure: Once tuberculosis has invaded the larynx prompt therapy is of importance and to begin with especially that of the interarytenoid space. Early energetic treatment will do a great deal not only towards alleviating and curing the early manifestations, as cough, etc., but also towards preventing the secondary and tertiary destruction so often met with.

A case of this kind is that of Mrs. P. G. She had an interarytenoid thickening that was treated with nitrate of silver and then zinc chlorid solution up to 15 per cent. There always were and still are present slight irregularities of the left vocal cord, but the process is stationary, without giving any symptoms excepting slight huskiness of the voice. The interarytenoid space appears normal now and the cough has disappeared.

As long as the surface of the larynx is intact, the case is generally of a simpler character, and we are justified in giving a somewhat hopeful prognosis. Spontaneous cures at this stage occur not infrequently. With the appearance of ulcers, however, the portals are opened wide for a pernicious secondary infection and pari passu for many troubles to the patient.

We must consider, therefore, that class of cases which present ulcerative processes in the larynx and so frequently are attended with dysphagia. It is here that so much progress has been made, a fact so encouraging to every worker in this field of medicine. The treatment can best be described by citing illustrative cases. Mrs. Mary D., both lungs affected, showed ulcerations of a mild character on both vocal cords, causing only slight dysphagia. She was treated with applications of tannic acid, chlorid of zinc, and finally argyrol three times a week, with the result that the ulcers healed entirely and have not given her any trouble for the past four months.

Such mild cases are unfortunately not the rule. But if every case of pulmonary tuberculosis were examined intralaryngeally, many such instances would be found, where the patient does not complain much about his larynx, but believes that any irritation there is only caused by his pulmonary troubles. Treatment started right then, and there will be of great prophylactic benefit to the patient.

The more advanced cases show an abundance of ulcerations which often are combined with tuberculous infiltrations, perichondritis of the arytenoids, epiglottis, etc., and in the majority of instances are dreaded because of excruciating pain occurring mainly during the act of swallowing. What is needed here is not cocain, an anesthetic of short duration, but a prolonged analgesic of the larynx, that will put that organ at rest for days, relieve the pain and cough, thus giving nature a chance to heal the progressing laryngeal condition. Remember that the best table d'hote dinner is of no value to him who cannot swallow a morsel of food, nor a drop of water in spite of the greatest hunger and thirst. Thousands of such poor creatures are perishing every year from mere starvation.

To relieve this condition many drugs have been tried. You may use anything that in your opinion will do some good to your patient. But the remedy par excellence to be employed here is orthoform. If the patient is benefited by any other means, nothing further need be said. Anything that relieves the pain will serve the purpose. But if this is not the case and a patient is allowed to suffer from marked dysphagia for weeks or months, the physician commits a great injustice if he does not resort to orthoform. This drug has done so much good in my hands that I cannot help placing it on top of the list in all ulcerative, painful processes of the larynx. It is generally applied in an emulsion, the formula of which I published before, but which may be added here:

℞ Menthol.....0.6 to 6.0
Formaldehyd 0.6
Orthoform 6.0
Ol. amygdal. dulc. 15.0
Pulv. acaciae 15.0
Aquæ ad.....60.0
M. f. emulsio

Unfortunately, orthoform is no longer available in this country. (Since there is peace now, let us hope that we may obtain it soon again.) A peculiar coincidence happened in the hospital. At one time there was quite a "run" on the emulsion among this class of patients. Almost everyone asked for it. Suddenly this stopped and the patients declared that the

emulsion was of no benefit to them. The riddle was solved by one of my adjuncts, who found out that the druggist, being unable to procure orthoform, had substituted anesthesin for it. Undoubtedly anesthesin is of value in some cases, but not in the majority of this class.

Another drug recommended as an analgesic of prolonged action is propaesin. This acts much better than anesthesin, but its beneficial effect is seen in a smaller percentage of cases than where orthoform is used. I am constrained to make this statement, which conflicts somewhat with that made in a former publication. Such is my present experience, but is it possible that the war had something to do with the purity of the drug? I do not know. However, propaesin is an important drug which cannot be ignored.

Another medicine belonging to the orthoform group is cycloform, which chemically is isobutyl para-aminobenzoate. It was recommended several years ago by Albert Rosenberg of Berlin, and I was glad to secure a few ounces during the war at a time when it was impossible to obtain any of the other drugs. Cycloform, too, has analgesic properties which are of value. It may be given with coryfin (1:25 coryfin), but any other oil will do, if coryfin should be too strong for the patient. Let us consider several of my cases:

Mrs. ———, 42 years of age, had suffered a great deal from dysphagia. She received the orthoform emulsion twice a week and finally was able to swallow food with little difficulty. Her pulmonary condition, however, was getting worse, and mainly for that reason I sent her to a climatic resort. There she did not receive the orthoform treatment, although she begged the laryngologist for it, and what happened? She relapsed into her former state. After staying there several weeks she returned to New York in an exhausted condition. Right after the first treatment she could eat again. After a week, when she was in the status quo ante, she asked me: "Doctor, why did you send me away?" This case is not reported for any personal reason, but to demonstrate how slow some colleagues are in adopting new methods.

Entirely different was the course in another patient, Miss D. M. She had been suffering from ulcers over the right vocal cord and both arytenoids that caused severe dysphagia.

She was treated by a former assistant of mine according to the methods discussed here and began to improve. Then she came to my department of the hospital, where the treatment was simply continued. Although the larynx seems absolutely healed now, she still comes for treatment. The reason she gives is that she still has a slight irritation, not in the larynx, but in the trachea. This is always relieved by the injections of orthoform or propaesin. Her pulmonary condition has not improved, but she coughs very little, can eat well and generally feels much better than for a long time.

Another case is that of M. R., a laborer, 39 years of age, who consulted me in a desperate condition. It was the old story, heard so often: He had to support a family and was forced to work in spite of advanced laryngeal and pulmonary affection. The lungs were in the socalled second stage of the disease, while the larynx was marked by such destruction that it seemed almost impossible to do anything for him. His epiglottis was one mass of broken down tissue, the arytenoids were much enlarged by perichondritis. One deep ulcer was at the junction of the left vocal cord and arytenoid cartilage and a smaller one on the other side, etc. Owing to dysphagia he was so greatly weakened that he was a deplorable object. At once treatment was started. Cocain had to be applied first, as his larynx was so irritable that nothing would stay there. He was able to see me once a week only, and yet for six months not only was he kept alive but even gained somewhat in strength. The analgesia generally lasted for four to five days, so that he could take food during that time. In this case not only was orthoform used, but many other applications to be discussed later. At the end of six months he managed to go to the mountains, although still in a bad condition. For the greatest portion of the last half year he has been without pain.

Now I would like it to be understood that with the application of an analgesic but a small part of our work is done. Of course, such patients should receive general treatment, a proper diet and internal medication. Among the remedies which I favor especially are arsenic and calcium lactate, etc. But it is just as important that other parts of the respiratory tract be looked after. Sometimes the laryngeal affection is

the sole cause of the cough. In most instances, however, there are other factors in the upper or lower air tract. If the nose and throat are cared for, as outlined above, and the patient still continues to cough, even after the application of orthoform, then the cause is to be found in the lower respiratory tract. In such cases morphin has to be given, eventually in big doses. The most important factor in the cure of the laryngeal condition as well as of the patient himself, is the healing of the ulcers. Now if the larynx is rendered quiescent by an analgesic and the patient still coughs, the ulcer will never heal. It is like pulling about a fractured limb instead of putting it in such a position that it cannot be moved. If, therefore, we succeed in quieting the larynx, when ulcers are present, nature will do the rest.

Since orthoform is not toxic, it may be used as often as the symptoms demand. That is, if the effect lasts a week, the remedy need not be applied more often. If its action lasts only a day, it should be used daily or even twice and three times a day. In addition morphin must be given whenever indicated. The writer is led to emphasize this point, since some fanatics would place all narcotic drugs on the prohibitive list. Prohibit alcohol, prohibit narcotics—one is just as bad as the other.

OTHER DRUGS.

It is natural that by applying analgesics or other agents it is the intention not merely to allay pain, but also to put these parts at rest so as to give nature a chance of healing the ulcers. If nature does that, she does it well. But if she is not inclined to help us, one has to resort to the drugs that were formerly in vogue exclusively. All kinds of astringents, caustics and antiseptics were recommended and later discarded. But since it has been the writer's experience that various drugs may have to be tried until one is found that does the work, the lesson was taken to heart never to give up the fight. Even after finding the right application it may lose its effect gradually, and you will have to resort to another, only to return to the former after weeks or months. It is wonderful how well one may succeed, if one is persistent enough. A few of these drugs may be mentioned here, just as they come to my mind: Alum,

tannic acid, lead acetate, calcium phosphate have been applied in solution or powders. Then silver nitrate, zinc chlorid, caustic potash, lactic acid, iodoform with ether, sublimate, and last but not least formalin have been tried and frequently discarded. Some of these were claimed to be very effective and positive cures were reported. These cures were due not only to the attempt to change a septic ulcer into an aseptic one, but more so to the fact that through all these efforts laryngologists became more hopeful and paid more attention to the larynx and the general condition of the patient, thus achieving definite results.

One of the older remedies deserves special mention—that is, the balsam of Peru, a drug recommended long ago for tuberculous cases by the older Dr. Sayre, the well known orthopedic surgeon. Schnitzler of Vienna applied it to the larynx and speaks of it with great enthusiasm. It certainly works well in some cases, and the combination of balsam of Peru with collodium, as recommended by Schnitzler, is undoubtedly a good one. By this addition a protective covering is formed, under which superficial erosions heal readily, the secretions are diminished, and infiltrations become smaller. Even deeper ulcers soon show a tendency to clear up and improve. I prefer the following formula:

℞ Balsam. peruv.....15.0
Olei menthæ
Collodii elast.
Alcohol, aa..... 5.–

This formula combines mild bactericidal properties with an effect that is gently irritating, at the same time producing cell proliferation, through which the therapeutic result is gained.

The last drug to be mentioned is pure carbolic acid for ulcerations in the larynx. It is applied directly without previous cocainization (Edward W. Collins) and has sometimes an excellent effect on these ulcers. Collins never saw edema following its application.

THE GALVANOCAUTERY.

If the ulcerations do not yield to mild treatment by astringents and analgesics, something more must be done. The

electrocautery is a wonderful remedy in this respect. The ability to apply the cautery point to every nook and corner, and, as Rüedi has lately remarked, destroying the tuberculous foci thoroughly, is a great advantage over other methods. Besides the wound thus made is immediately closed up by a thick slough and any danger of a reinfection removed. The writer feels very enthusiastic concerning the galvanocautery method. To mention only one instance, I will state that at one time there were three patients at the hospital who begged for this treatment. In all of them the galvanocautery point was applied deep into the ulcers. Two of them left the hospital with the larynx cured, although there was little improvement in the lungs. Mermod of Lausanne has had excellent results with galvanocauterization in these cases, and I believe it was also Mermod who said that one should not cauterize "pour bruler," but to destroy as much tissue as possible.

Escat, on the other hand, declares that there are more contraindications to this method than indications. Among the former are: stenosis of the larynx, dysphagia and advanced pulmonary involvement. The writer fails to see the wisdom of the two last mentioned contraindications. Dysphagia is one of the very reasons for this application, and so, I am inclined to say, is advanced pulmonary tuberculosis. There is no danger of a new infection and hardly any loss of blood. Besides, in these desperate cases there is nothing to lose, anyway.

In spite of this, my enthusiasm, I cannot help feeling surprised at an article by Rüedi of Davos in connection with this method. Rüedi saw in six years 575 patients afflicted with laryngeal tuberculosis. In these 575 cases he performed 1,548 "operations" (i. e., electrocautery applications), an unusually high number, if one considers that only 59 of his cases were grave, according to his own statement.

Mechanical Dysphagia.—I agree with Rüedi, however, as to the use of this method also in closed infiltrations, as for example, edematous perichondritis. I believe it was Grünwald of Munich who first recommended the cautery, not only in ulcers but also in perichondritis. Those large arytenoids, for example, are frequently a cause of pain, the swelling alone being responsible for it. The old saying: tumor, dolor holds good here. By applying the cautery one is able in some in-

stances to reduce the size of the cartilage and relieve the mechanical dysphagia due to the large size of the arytenoids.

It may be proper here to warn against being too bold in using the galvanocautery. A reactionary swelling and edema may set in and cause trouble. In Siebenmann's cases (66) this was so severe that twice tracheotomy had to be done and once intubation. One patient died in spite of the tracheotomy. This is the more remarkable since Siebenmann's method is nothing but a superficial cauterization, while Grünwald penetrates much more deeply with the galvanocautery point. The application of the cautery to the posterior commissure is best carried out under straight laryngoscopy. As W. Albrecht has shown, it is easier thus to judge about the extent of the process, etc. But with this method or any other a breaking down of the tissue will afterwards occur in some cases.

ALCOHOL INJECTIONS.

There are patients, and, I regret to say, many who are not relieved by any of these methods. For them injections of alcohol into the supralaryngeal nerve have been recommended as another means of affording relief. Since the writer has been repeatedly asked how these injections are made, he takes the liberty of briefly repeating what he said when injections of alcohol were mentioned for the first time in medical literature in this country.[6] Braun and Valentin injected cocain into the superior laryngeal nerve in order to produce anesthesia for endolaryngeal operations; but Hoffmann* of Munich was the first to employ alcohol injections for analgesia of long duration. The place where the superior laryngeal nerve penetrates the membrana thyrohyoidea can be felt with the finger from the outside. If the patient be placed on his back and the larynx pushed toward the affected side the most painful spot can be determined with the finger. Here the needle puncture is made in a direct vertical line to the body, a little more toward the outside. The needle is inserted to a depth of about 1½ cm., feeling meanwhile for the spot where the

*The writer was shocked by the news that Rudolf Hoffmann, that gifted young colleague, was murdered in Munich on May 1, 1919, by an anarchistic mob just at the moment when he tried to bandage one of their wounded comrades in a street of that city.

patient complains of the greatest pain, and here the alcohol is injected. Hoffmann recommends 85 per cent alcohol and of a temperature of 45° C., equal to about 112° F. The writer has used the same proportion.

After the subsidence of the initial pain, which is sometimes quite severe, another injection is immediately made. Hoffmann advises a strong and somewhat blunt needle, which is preferable, as it avoids the blood vessels and is less liable to break. In making injections with an ordinary hypodermic needle there is risk of its breaking, and it is a difficult matter, even at present, to extract a needle from the trachea or bronchi of a tuberculous patient. For this reason it is always best to employ a strong needle and to tell the patient neither to swallow nor to talk until the procedure has been completed.

It is not always easy to strike the nerve. The best proof that we have done so is the pain following the injection. If this is not complained of immediately, the result of the treatment is generally nil.

The advantages of this method are undoubtedly great, if compared to operative procedures. The injection is very simple and the analgesia lasts from a few hours to one week. The last, alas! is not the rule. A. Gignoux of Lyons is right when he tells us not to forget the unsuccessful cases.[7] For, after all, the injection must be made blindly, and one must rely a good deal on the patient's word. Consequently, sometimes the injection is too superficial or it is too deep, in which latter event a few drops of alcohol may enter the larynx, causing violent pain, or, according to Adolf Blumenthal of Berlin, alarming dyspnea; in neither instance is any benefit derived from the injection.

Bradt of Berlin not infrequently noticed edema of the arytenoids and aryepiglottic folds on the day of the injection or the day following.

However, the good results achieved occasionally warrant me in trying it in selected cases.

A measure that promises to give better results is

RESECTION OF THE SUPRALARYNGEAL NERVE.

By this method we can always reach the nerve, since we are able to see what we are doing. According to A. Gignoux

of Lyon, the priority of employing this procedure belongs to Avellis of Frankfort a. M., who in 1909 reported one case operated on in this manner. In 1911 Blumenthal of Berlin published a technic for the resection of the supralaryngeal nerve (sc. its inner branch), and then came Moure and Celles of Bordeaux, Chalier and Bonnet, Liébault and Celles and others. It seems to be certain that the dysphagia always disappears after the resection. But the method is too new to warrant our passing an opinion. In addition, it should be mentioned that through the resulting lack of sensibility certain disagreeable symptoms develop after the resection. Of the two patients operated on by Gignoux one died four weeks after the operation from causes not mentioned. But the dysphagia had been eliminated! As this method, however, may prove of value in the future, it will be described here according to its modification by Chalier and Bonnet,[8] which seems to be preferable at present and which the writer has used in one case. An incision 3 cm. long is made, beginning 1 cm. outside of the median line and reaching to the middle of the space comprised by the cornu majus of the hyoid bone and the superior border of the thyroid cartilage. After incising the skin, etc., the fine fibers, which are the prolongation of the cervical aponeurosis, are cut through from within outwards on a grooved director. Thus one finds the thyrohyoid muscle at its upper insertion. Towards the outer border of this muscle there is found the superior branch of the laryngeal nerve, which is always situated above the superior laryngeal vessels about half way between the hyoid bone and thyroid cartilage. Without making any attempts at freeing the nerve, it is cut through, and in case of necessity the whole visible portion excised, both trunk and branches.

As mentioned above, the writer has operated on only one patient by this method, and he was too weak and too far gone to permit of an opinion as to its value.

Zencker in the *Münchener Med. Wochenschrift* (p. 1167, 1919) and in a personal communication to the writer, recommends this method, not only as the safest way of anesthetizing the larynx, but also as a curative measure.

As the treatment of tuberculosis of the larynx cannot be separated from that of the rest of the body, the use of the dif-

ferent rays must be considered here, not only because of their general effect, but also because most of them possess analgesic properties which are of some help in relieving dysphagia.

HELIOTHERAPY.

This, as just mentioned, is treatment by the actinic rays of the sun or by those of the electric light. As far as the sun is concerned, it is the simplest, the oldest and the most neglected therapeutic agent.

In the last decade of the past century so much had been written on this topic that as a result light therapy became the prevailing method of treatment in many a specialty of medicine. This is now almost forgotten. Although in this country the motto air and light, was the slogan for the tuberculous in every textbook and every pamphlet published, the great importance of sunlight itself as a curative factor has been greatly underestimated and neglected. Psychologically, this can be easily explained on account of the depressing effects of the sun during the greater part of the summer. People seek protection against its heat, forgetting that a beneficial effect from its rays can only be expected in a milder climate or a suitable locality (seashore, etc.).

The credit for demonstrating the healing power of sunlight belongs to Bernhard[9] and Rollier.[10] Bernhard was the first physician who made use of heliotherapy at his place in the Engadin in the treatment of tuberculosis of bones and joints. Before that he had successfully experimented with sun rays on torpid ulcers, seriously infected wounds, etc. Rollier treated exclusively tuberculosis of bones and joints at Leysin, where he had at his disposal a hospital of 500 beds. Of interest are also the experimental studies of the effect of sunlight upon the repair of fractures made by Harold Neuhof of New York. His results have an equally important bearing upon our theme, because they show that the healing power of the sun's rays is a general one on the body tissues. (Interstate Med. Jour., No. 8, 1917.) This statement is not contradicted by the observations of Léon Philipp,[11] who has never seen a complete cure of laryngeal tuberculosis by heliotherapy for the reason that the stay of patients at his sanatorium was limited and they were discharged too soon. On the other hand,

he claims that the results obtained were favorable and would have been still better if heliotherapy had been combined with other therapeutic measures, as curetment, galvanocauterization, etc. As it was, in three cases of twenty-three the treatment had to be stopped on account of hemoptysis and mild edema of the larynx. In two cases he observed no improvement; in all others, however, a most favorable influence was noticed, especially of the subjective complaints, such as hoarseness and dysphagia. (See Intern. Centralblatt für Laryngologie, p. 210, 1917.) Of late P. F. Armand-Delille has used heliotherapy as a prophylactic measure in children whose mothers were suffering from tuberculosis. He established sunlight schools, the place for which was carefully selected every day. Morning and afternoon sessions were held, and the children were placed under good hygienic surroundings. As was to be expected, the results were excellent.

Without going into details of this prophylactic work, I feel there is one question supreme in the minds of thoughtful physicians: i. e.,—why do we permit healthy children to be sent to schools where they are bound to acquire all kinds of infections and where so many of them positively do contract tuberculosis? Life is more important than education. The efforts to establish open air schools are laudable and to be encouraged, but they are only the beginning of making the school safe for healthy pupils.

The effect of light (sunlight, diffuse daylight, electric light) on the organism has been studied from various points of view. Its bactericidal action is a factor not to be overlooked. But, as mentioned above, the most important one is the general effect on metabolism. It raises the power of resistance and with that alone a great deal is gained.

As physicians we should naturally be aware of the deleterious effects that direct sunlight may have on tuberculous patients and should guard them against accidents. The writer will never forget a socalled "sanitarium" he saw in one of the Western States, the director of which was a fantastic quack, who, ostensibly out of charity, took poor children from the slums of a large city to the hot climate in the West. He gave them all the sunlight possible and very inadequate food (of course, no medical treatment). I have never seen a more

pitiable lot of children than those out there. This goes to show how far ignorance combined with fanaticism may lead. However, heliotherapy is a factor in treating tuberculosis that cannot be overlooked.

The laryngologist who attempts to treat laryngeal tuberculosis must be somewhat of an internist, and for that reason these general rules are discussed here. Local applications alone will seldom suffice; more is required. In many modern sanatoria heliotherapy is given in a room called the solarium. This makeshift—pleasant as it may be occasionally on a cold, sunny winter day—can never replace heliotherapy outdoors, as it ought to be used. The only correct way of application is by exposing the whole body naked to the rays, in other words, by taking sun baths. More about these later.

Now a word about raiment. Since man protects himself against the inclemency of the weather or for other reasons with garments, the rays of the sun cannot strike him directly. In order to determine the permeability of wearing materials, Boubnoff[12] used photographic paper and thus was enabled to judge the permeability of various garments from the findings on the paper. Undyed animal and vegetable threads allowed more chemical rays to penetrate than dyed ones. If, therefore, sunbaths are administered the body should be naked, or, if some covering is desired, it should consist of undyed thin goods.

Sunbaths in the open cannot be taken without exposure of the body at the same time to the prevailing atmosphere, thus combining heliotherapy with aerotherapy. The experience gained by these two methods is sufficient to convince everyone of their usefulness. They should replace a solarium. A modern sanatorium should have a special large space in the open for men and another for women, where they can exercise naked or clad very lightly in suitable weather. Very soon it will be noticed that almost any kind of weather is suitable. This treatment can be carried out at the seashore (thalassotherapy) or in the mountains (altotherapy, a word coined by the writer several years ago).

For many years I have sent a certain class of tuberculous patients to the seashore, especially those suffering from rhinitis or pharyngitis sicca or atrophicans. They were advised to take

sea baths—that is, if they were strong enough to take a dip, come out, get dry in the sun and repeat the procedure. Where there is no water, the woods will be of benefit in taking sun baths, using the shade of the trees to cool off occasionally.

SEA TRIPS.

A further step in this direction are sea voyages. Although it is hardly to be expected that sea trips will be made use of under the present disturbed conditions everywhere, yet there is hope that peace on earth will be restored some time and there will be a revival of universal hygienic and therapeutic endeavors. Trips on the ocean are more important than a stay on or near the shore. Here on the Atlantic coast the air in summer is too often oppressive and debilitating to the patient. Too frequently there is hardly any air stirring, or when the wind blows from inland it brings with it mosquitoes and great discomfort. Things are different when cruising on the ocean in a slow going steamer or sailing vessel. Then there is almost always an air current and an absolutely pure and moist atmosphere so very refreshing for any weakened system.

A. Air Currents.—No matter in what climate a patient may be, a gentle, fresh breeze is always desirable. The writer has often observed patients in our western and southwestern states during the hot season, who would have been happy had they been able to get a breath of fresh air. As it was, they were simply prostrated by the heat. And this was in districts justly recommended and highly beneficial during cooler weather. While high winds and gales are certainly to be avoided, the idea that an absolutely even temperature and stillness of the air is required is just as wrong and pernicious. Let the patient have mild, fresh air and he will naturally breathe deeper without having to resort to gymnastics, which are not always without risk.

Besides, gentle breezes harden the system against inclemencies of the weather, have an invigorating influence on the nervous system and are apt to increase appetite and metabolism.

B. The Purity of the Atmosphere.—A discussion on this point seems superfluous. For what habitable region has an

atmosphere as pure and aseptic as that of the ocean? Mountainous regions are very good, indeed, but in most of these places there is always more or less dust. Only on the highest peaks of some mountains are conditions more favorable, but few of our patients can avail themselves of these.

C. The Humidity of the Air.—Since the medical profession has been taught, at least for the last five decades, that only dry air is of benefit to the tuberculous, and as many of our climatic resorts appeal for support because of rival claims of one or one-half degree more or less dryness, this would show that humidity is often considered a contraindication. But remember that the rules for the consumptive have been laid down by the internist, often to the detriment of the patient. The laryngologist rarely bothered about general conditions and the patient was the loser. The indications for a moist atmosphere have been referred to above. Let me repeat here that a dry, hacking cough, a dry or atrophic rhinitis or pharyngitis and an ozenatous nasal or pharyngeal condition are absolute indications for a moist climate.

The chemical composition of sea air is a further beneficial factor for many patients. In laryngitis of a marked irritating character saline inhalations are often beneficial. On the ocean you inhale this salt air constantly. Besides there are other salts that get into the circulation by inhalation, viz., iodin and the bromids (sodium, potassium and ammonium bromids), and they, too, work well.

What class of patients will derive benefit from a sea voyage? The first requirement for such a patient must be his ability to resist seasickness. Anyone who cannot readily stand a trip on the water had better stay home. Furthermore, only incipient cases, and preferably those without expectoration, should be permitted to go on such a trip. If we ever reach the goal to have special boats equipped for the tuberculous, then even more advanced cases may be taken, provided there is competent medical aid on board and all hygienic regulations carried out to perfection. This is a dream for the future. A sea voyage will be of special benefit to those consumptives who have been overworked and have become nervous. The absolute rest and freedom from business cares on a boat will do more than a rest cure in any sanatorium.

It is self understood that suitable cruises will have to be selected and the trips varied according to season and other factors, as financial matters, etc.

RAREFIED MOUNTAIN AIR.

As to recommending the rarefied air of the mountains, one must be careful about the altitude, especially in advanced and cardiac cases. Some of these patients feel uncomfortable in the east, even at an altitude of 1,800 or 2,000 feet, and in the west at 5,000 or 6,000 feet elevation. Such people should gradually work their way up to the different altitudes or stay at lower levels. I know that crossing the Raton Pass on the road to the west has been detrimental to many a patient. Not long ago I had experience of this kind at another place, viz., Cloudcroft in New Mexico. While out west arrangements were made for me to go up there with a party, starting from a small place in New Mexico. Before going up to that most interesting and beautiful spot, which has an elevation of about 9,200 feet, I was asked by a young woman, who I knew suffered from laryngeal and pulmonary tuberculosis, whether she could join the party. I strongly advised against it, but received the answer: "Oh, well, last year I went up Pike's Peak and it did not hurt me; why should this?" All I could say was this: "If you know better, why do you ask?" A day after arriving on top of the mountain I was hastily called to that young woman. When I entered the room she had already succumbed to a pulmonary hemorrhage.

All this may be well known to most practitioners, but it is too often forgotten.

An important factor in the treatment by sun rays is

THE CLIMATE.

To answer the question what is the best and most suitable climate for cases of laryngeal tuberculosis, with or without pulmonary involvement, I would say: That climate is the best where a patient receives the most careful treatment by an experienced laryngologist. For, above all, our patients need local therapy—often a most difficult matter to obtain in the country. If this be secured, there is the choice between seashore and mountains—in other words, the choice of a proper

climate. Here one should always remember that for many tuberculous patients climate is the decisive factor. We all know that many a patient is living and attending to his business at Denver, Colorado Springs, Liberty and a host of other places, who would have been dead long ago had he returned to some large city, where his home had been. Yet there are some physicians who try to deny this fact. All this holds good for laryngeal tuberculosis as well, although one has to be more careful with that class of cases. For example, many patients with laryngeal affections cannot stand high winds, while for others a low temperature is absolutely contraindicated. To a great extent we have to be guided here by the personal observation and feelings of the patient. When low temperature or high winds irritate any portion of the upper air tract, and the patient has to cough as a result of this, we know that such a locality is unsuitable. On the other hand, patients with laryngeal complications stand the air at sea level and on mountains just to about the same extent as other patients. High altitude in itself is not a contraindication for tuberculosis of the larynx.

Some medical men, among them those in high political positions, have begun to wage war against the centuries old experience that climate has a beneficial influence on tuberculosis. True enough, the practice of trying to get rid of a patient, who is practically dying from consumption, by sending him thousands of miles away, cannot be condemned too strongly. But nobody can deny the eternal truth that the rays of the winter sun in the south or west are different from those in the east, nor, for that matter, that the summer sun in Manhattan is not of the same benefit as that in the Catskills or Adirondacks. But summer or winter, the climate of Manhattan is different even from that of Coney Island, for example. The sun is different, and so is the purity of the air, the degree of humidity and everything else.

The trouble is that so far no strict indications have been laid down for the various climates and that the laryngologist has not been consulted on that question. According to my experience, there ought to be places in the city or vicinity where laryngeal cases in the incipient and terminal stages can be taken care of properly. The poor are provided for and

so are the rich, but the middle classes are absolutely neglected. (To our discredit this must be said.)

If, then, we find a patient suffering from any dry condition of the upper air tract, we know that he needs a pure, moist atmosphere, which he can best secure at the seashore, or, for that matter, on the water (sea trips, etc.), but not in the city, especially not during winter.

The writer has shown elsewhere that at the end of the winter season the process of desiccation in the upper air tract is much more pronounced than at the beginning of the winter. This condition was found at the Montefiore Hospital Sanitarium at Bedford Hills, in the vicinity of New York City. Undoubtedly the same could be observed in other places, where on account of the cold weather patients cannot get the benefit of the open air all day and night. The mode of heating that has to be adopted in winter means desiccation of the upper air tract. Perhaps the lower respiratory organs are affected similarly at the same time. An excess of secretion does not necessarily exclude a dry mucosa.

But there is one more point to think of—i. e., the action of the tubercle bacillus in attracting humidity from the neighboring tissue and in later stages also from distant parts, thus directly desiccating them, or, as Drozda calls it, exsiccating. This process is one of the most important factors that prevents the loosening of the bacilli from within the lungs and their final elimination from the system. Thus from this general viewpoint, too, patients will often need a moist climate.

On the other hand, a great deal of secretion from the nose or throat or bronchi makes a dry climate imperative. The most suitable altitude has to be selected according to general rules. If in spite of careful consideration and selection of the proper resort the patient does not do well after a certain lapse of time, he ought to be transferred to another place, as nobody can say beforehand: this or that climate is the only one that will help you positively. For this reason a sanatorium for the tuberculous confined to only one locality seems to me antiquated. A proper sanatorium must be divided into three sections, placed in different localities: one at or near the city, another at the seashore and the third in the mountains. I

repeat here for the thousandth time: There is no need for an expensive hospital equipment to care for the dubious or incipient (without expectoration) cases. They are not a menace to the community and can be taken care of elsewhere. But the great and constant need is for hospital care of laryngeal cases, especially the more advanced.

In this respect permit me to quote from a paper by Dr. Sherman G. Bonney[12] of Denver, Colo., who says: "It seems opportune to call attention to the limited scope of the sanatorium whose field of usefulness at present is not sufficiently broad to include the admission of advanced tuberculosis. Without desiring to detract in the least from the great utility of such institutions open to incipient pulmonary invalids, the fact remains that patients of this character do not, as a rule, constitute such a menace to society as the advanced cases and are rarily so ill as to demand that degree of personal supervision which necessitates residing under the same roof with a resident physician and corps of assistants. Many of these with proper industrial opportunities and in a suitable climate could easily become self supporting. While added opportunities for recovery are being offered to incipient cases, it is difficult to comprehend in what manner recent clinical effort has benefited the apparently hopeless or far advanced consumptive. He is denied admission to all sanatoria, because his condition is not such as to comply with requirements stipulated in their blanks of admission. He is persona non grata to all municipal hospitals. It might almost appear that these unfortunates may profit from the recent agitation concerning consumption only to the extent of receiving a few educational leaflets telling them where to expectorate, how their bed linen shall be disinfected, and how their apartments may be fumigated after death. He is privileged to be duly registered at headquarters, and to receive instructions from some responsible medical source, but he is forced to appreciate the fact that he constitutes at best a source of danger to his family. He is told in his educational leaflets 'to avoid the germs of consumption, to have a cheerful mind and a clear conscience, and to get an abundance of good food and good air,' yet he is denied by virtue of his very needs and requirements those advantages which are freely bestowed upon others less

worthy upon the score of their actual needs, and who constitute elements of far less danger to the public."

Since it is known that the rays of the sun have analgesic as well as general properties in laryngitis dolorosa, other rays have been used in place of these in cases where the former were not always available, and we shall now discuss

THE TREATMENT WITH THE VARIOUS ELECTRIC RAYS.

A. Electric Light Therapy.—The beneficial results of treatment with the electric light are due to the action of those rays which most closely approximate the sunlight, viz., the blue and ultraviolet of the arc light. For particulars as to the action of these rays the writer would refer to his former publications on this subject.[13] In these papers were discussed not only the physiologic properties of these rays, but also their therapeutic effect. The question whether the rays of an electric arc lamp penetrate into the larynx is answered readily by the well known fact that we can see the interior of the larynx brilliantly illuminated when we place even a small lamp on the outside of it. (Translumination.)

Whether through any or all of these rays a bactericidal action is brought about or not, appears to me immaterial nowadays. Formerly that seemed to be important, but at present I can only say: What difference can it make as regards the final cure of the tuberculous process, if we really succeed in killing a few bacilli in the larynx, so long as they circulate in the blood? Of greater importance in our endeavor to cure the disease in the larynx became the aim to subdue the dysphagia. Once that battle is won, nature takes care of herself by producing normal conditions under favorable circumstances. In that respect electric light helped us occasionally. In all our cases it was applied only externally by means of the old Voltolini lamp for transillumination, as modified by the writer.

Other investigations have thought that they could get better results by using a system of mirrors for the purpose of reflecting the rays of the sun or the electric light directly upon or into the larynx. Thus Jos. Sorge of Davos and C. W. Miller, together with A. M. Foster of Colorado Springs, have employed various kinds of appliances and have reported good

results. But it seems doubtful whether anything has been gained by these complicated methods. In difficult cases they are of no avail, and in milder ones they are not needed. The case reported by Blumenthal is of importance in this connection. He applied the rays every day for ten minutes to the larynx, which had been opened by laryngofissure, but without success. Although some benefit could have been reasonably expected, there was none. Of course, one case is not conclusive, but it certainly shows that these rays do not always cure, even when applied in the most direct way possible. This, of course, does not imply that we should give them up entirely. Indeed not, for in some instances they have been of benefit and have relieved the patients' sufferings to some extent, and they should be tried.

B. Fulguration.—This is applied either externally or intralaryngeally. In the first instance a larger electrode is used, and the spark gap may be changed easily to suit the case. For the intralaryngeal application of the high frequency current a long vacuum tube is employed curved so as to correspond with other laryngeal instruments. Here certain difficulties have to be overcome, as the irritability of the patient, etc. The sparks cannot be controlled as well and one has to be on the watch constantly.

All the sparks from this socalled brush discharge contain such an abundance of violet and ultraviolet rays, and their mild caustic effect is so evident that their application is indicated for several reasons. Their therapeutic effect is evidenced by some degree of analgesia as well as by a slow improvement in the ulcerative process.

STENOSIS OF THE LARYNX.

In this, the last chapter, only operative procedures will be discussed and mainly those that are necessary for the relief of a stenosis of the larynx and the trachea. According to the writer's experience, a stenosis is the only indication for operative work either within or without the larynx. But there is one more point we have learned through experience, and that is to avoid external operations in this class of cases as much as it is compatible with the pa-

tient's respiratory function. The disappointments in all operative work have very frequently been depressing, although occasionally encouraging results have been achieved. This holds good as long as the tuberculous process is still active. When it has come to a standstill, then the situation is altered as a rule and one is apt to get better results.

INTRALARYNGEAL OPERATIONS.

Speaking of the indications for various operative procedures it will be readily understood that there is nothing specific in the pharynx that would call for an operation in tuberculous patients except those conditions found in other persons as well and some others mentioned above. It is entirely different in the larynx. Here a great variety of pathologic conditions are found that cannot be removed except by an operation. To begin with the epiglottis: Tuberculous infiltrations of this normally small organ are not infrequently so enormous that the entrance to the larynx is entirely obscured and breathing becomes difficult. Very often there are ulcerations present in the regions below it which cannot be seen but can be surmised by the difficulty in deglutition. Naturally, such ulcers cannot be treated, and the patient loses constantly. In such instances the removal of the epiglottis is indicated. Once this amputation has been decided, there is only one ideal way of doing this, viz., by means of suspension laryngoscopy, the method originated by Gustav Killian of Berlin. In advanced cases more or less hemorrhage, sometimes a dangerous one, may be expected, but otherwise it is the procedure that enables us to work most quickly and with comparatively little discomfort to the patient. After the patient is once in the right position, the amputation of an epiglottis does not require minutes, but seconds. We have repeatedly had such experience and so undoubtedly have others. It makes little difference whether a big biting forceps is used or, as Arrowsmith prefers, a snare.

Infiltrations of the vocal cords or ventricular bands were removed extensively in former years. Nowadays, the writer does not operate on them, unless they have produced or have a tendency to produce laryngeal stenosis. That this can be done with the double curette of Krause or Heryng is beyond

doubt, since the writer himself has done it so frequently. But for the removal of stalactite formations at the posterior commissure as well as for other more pronounced formations, especially when there are stenotic conditions present, suspension laryngoscopy is also the best method available. It is immaterial whether the galvanocautery is used or some cutting instrument or both combined.

It should be added that preferably all these patients should be operated on at a hospital or sanatorium, since a sudden tracheotomy may be required in any such case.

We now come to external operations, and, first of all, to

TRACHEOTOMY.

Moritz Schmidt recommended this operation as a prophylactic measure and he as well as a few others used it. The writer, although firmly believing in putting the affected organ at rest, never considered tracheotomy as the correct procedure and never employed it with that purpose in view. The only indication, in his opinion, was imminent or approaching stenosis of the larynx.

The prognosis of a tracheotomy is different according to the period in which it is performed. If a patient—I am tempted to say—is lucky enough to acquire a laryngeal stenosis in the early stage of pulmonary affection, then the prognosis is quite favorable. The outlook, however, is worse, if one is forced in the later stages of the disease or even when extreme necessity demands it. I have had patients in the first category who wore a canula for years with comfort after the pulmonary condition had healed and incidentally the laryngeal one as well. One patient, on whom I did a tracheotomy sixteen years ago, still wears it. His lungs are well. In the second class the results were disappointing in all but a few—that is, as far as an ultimate cure is concerned. Yet we have to resort to a tracheotomy whenever it is indicated. The question is: When is the right time to do it? When the attending laryngologist, after repeated examinations, sees that the lumen of the larynx is becoming smaller and smaller, and that there is a tendency on the part of the hostile forces to finally close it up entirely, then the sooner one operates the better for the

patient. Naturally many persons will object to tracheotomy in spite of an outspoken dyspnea and may go about for many months. That makes the outlook only so much worse. For if one has to defer operation until the last moment the patient is so much run down by lack of oxygen and nourishment that the prognosis is bad right from the start. A few histories may illustrate some of our experiences.

Case 1.—This is the patient cited above. He lived eight months with marked dyspnea until he fell down one morning gasping for breath. He survived tracheotomy only a few months. His chances would have been far better if he had allowed us to operate when he was first advised to have it done.

Case 2.—This is a unique case. D. K., aet. 32, came to me with his father, a physician, seven years ago, complaining of hoarseness. Diagnosis at that time: Chronic laryngitis. Half a year later conditions were changed so that the diagnosis of primary laryngeal tuberculosis had to be made. The lungs were clinically sound; no tubercle bacilli in the sputum. Soon the right arytenoid showed such a degree of perichondritis that dyspnea set in. Patient disappeared and was not seen until seven years later. At that time the epiglottis was much enlarged and ulcerated on one side and the arytenoid had become so much extended that both together obscured the laryngeal image. Patient had been smoking cigarettes incessantly, had been out to cabarets, theaters, etc., almost nightly, yet he felt quite comfortable. At least that is what he told me. His dyspnea is now audible, there being a slight stridor noticeable. Not much dysphagia is complained of, but he feels "delightfully easy" after the propæsin emulsion is applied. He has not consulted a physician since he left me seven years ago. The lungs are affected now. Wassermann negative. A tracheotomy is "out of the question," says he. Yet after two weeks his condition grew so much worse that he gladly consented to it. The operation in this case was somewhat difficult, as the patient had great difficulty in lying on his back. But finally we succeeded in finishing the operation, the patient being left in good condition. He is still under treatment, but ever since the operation everything in the larynx is breaking down.

Case 3.—E. G., aet. 25, was brought into the hospital in a moribund condition when I happened to be present. Tracheotomy was done immediately without any preparation or anesthesia. He made such a good recovery that six months later he was discharged after his pulmonary affection had shrunk to a small area that was still diseased. He wore a tracheotomy tube two years longer. In the meanwhile scar tissue had formed in the larynx and trachea, the removal of which was unsuccessful under local anesthesia. Consequently this was done under ether and a perfect passage established between the trachea and the mouth. Patient felt great comfort thereafter until a few weeks later, while taking a short walk in the park, he was seized with a hemoptysis, to which he succumbed in a few minutes.

Case 4.—M. M. underwent an early tracheotomy on account of approaching stenosis. His lungs were in the socalled first stage of the disease. He was absolutely quiet during the operation, did not complain of pain once, lost a minimal amount of blood and was taken to his bed in excellent condition. As I told my assistants, this operation might have been called an ideal one. However, six hours later, hemoptysis set in, followed by exitus letalis. In this instance I had expected that the patient would get over the tracheotomy easily and that afterwards by laryngofissure all the diseased tissue could be removed. This was one of our disappointments.

Case 5.—Quite different was the result in the case of H. N., who was referred to me from a tuberculosis sanatorium on account of increasing throat trouble. On examination the epiglottis was found to be much infiltrated and edematous, the arytenoids were large with marked edema and hardly moved at all. Only a small portion of the vocal cords could be seen. There was slight dyspnea. In this case it would not have been safe to apply the galvanocautery point to the arytenoids, since a fresh edema would have closed the larynx entirely. The lungs were only mildly affected. Consequently a tracheotomy was done, from which the patient recovered in a short time. After that it appeared safe to amputate the epiglottis, which we did, and after a long interval of about six months, during which time the patient had been in the mountains, the galvanocautery was applied. Patient again left

for the country, and on his return the larynx had improved to such a degree that the canula was discarded. This very exceptional and most encouraging case shows that in some instances a cure can be achieved, even under great difficulties. Our results ought to get better from year to year.

We now come to the question of laryngotomy and partial as well as total laryngectomy. At present one might expect good results from any of these operations in selected cases, when the operation is done at a very early stage of pulmonary tuberculosis—in other words, almost exclusively in primary laryngeal tuberculosis. The writer is inclined to believe that shortly the time will come when at least laryngotomy will be employed in any case of incipient laryngeal tuberculosis. Would it really be unwise, as some believe, to open up the larynx and remove every particle of diseased tissue at an early period? Surgically, this ought to constitute the most rational procedure, but would it also prove to be the most successful?

The effect of any therapeutic measure cannot be judged in a few weeks or months. A positive opinion in a chronic disease like tuberculosis can only be reached after watching a patient for a long period. Of course, in the case of dysphagia immediate results count for a great deal, as they render it possible for the patient to take food, gain in weight, become more hopeful, and may effect a change of the entire metabolism, etc. Later on, in the treatment of dysphagia, as in all other cases, only final results will count and stand the test of time.

By weighing carefully every measure or every drug recommended one will be successful in numerous instances. But do not forget that the reaction following any treatment or any operative procedure varies so greatly in different patients that one cannot lay down positive rules for all. The same treatment that will effect improvement or a cure in one case, in spite of the pulmonary condition getting worse or remaining stationary, will be followed by another by an aggravation of the symptoms or even by death. But by all means do something for your patients. Do not let them die with your hands folded. Results will crown your work if you try your utmost to help your patients. Rational activity with the aid of the means discussed in this paper will help you a great deal.

CONCLUSIONS.

1. Primary tuberculosis of the larynx does occur, and more frequently than has hitherto been accepted.

2. The prognosis of an established tuberculosis of the upper air passages is better than it used to be years ago.

3. All patients suffering from pulmonary tuberculosis should be advised to undergo a laryngologic examination, not only when the disease is diagnosed or on entering a sanatorium, but also at regular intervals, irrespective of their complaints.

4. The means at our disposal for the treatment of such patients are numerous and should be used.

5. Success depends largely upon untiring, conscientious and arduous work on the part of the attending laryngologist as well as on that of his assistants in case of sanatorium treatment.

6. Whenever the larynx is affected, such a patient should be under the supervision of a laryngologist, who is to take care of his lungs as well, and not under the direction of an internist, who very frequently does not even pretend to know anything about the larynx. In other words, the laryngologist should direct the general as well as the special treatment in all cases with laryngeal involvement.

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24 West 88th St.

LVII.

AN UNUSUAL TYPE OF NASAL TUBERCULOSIS.

By George E. Shambaugh, M. D.,

Chicago.

Tuberculosis of the nasal cavities is a rather rare condition. It has been recognized clinically in two more or less distinct forms. In the one, the hyperplastic form, a round cell infiltration leads to the formation of tissue masses, the tuberculome. In the other, the ulcerative form, the destruction of tissue is conspicuous. This varies from a superficial erosion to the formation of deep seated, excavated ulcers, which may invade and destroy the underlying bone. The two forms are often combined, the formation of the tuberculome preceding the development of ulceration. The case I am here reporting is one of miliary tubercular nodules involving the nasal mucous membrane, not associated with general miliary tuberculosis. As far as I am aware, no similar case has been reported in the literature.

The patient is a man 43 years old, who consulted me first 16 years ago, complaining at that time of nose and throat symptoms which were associated with marked enlargement of the cervical lymphatics, chiefly on the left side. He was a man of strong, robust build. The nasal symptoms had been annoying him for about two years. These were characterized by sensations of soreness and most annoying burning and dryness of the nose. A similar annoyance was experienced in the pharynx, especially in the epipharynx. The nasal symptoms were especially marked on the left side of the nose. The patient also suffered from a great deal of left sided frontal headache. The attacks of headache were quite severe and usually lasted two or three days. For a year before consulting me the patient had discovered that he was having an elevation of temperature varying, as a rule, from 99 to 101 degrees F. On one occasion, while under my observation, this temperature was as high as 104°, but in a few days subsided to the usual 101°. The enlargement of the cervical lymphatics

had begun to appear on the left side about one year before I saw him, and for six months these glands had been quite sensitive and painful.

An examination disclosed an enlargement of the cervical lymphatics beneath the angle of the jaw, on the left side, fully the size of a turkey egg. The posterior group of lymphatics on this side were also involved. On the right side the posterior chain of cervical lymphatics were enlarged to the size of a large pea. There was one isolated gland in the clavicular region about the size of a small hazelnut. The lymphatics in both axillæ and the groins were palpable but not sensitive.

A general examination was made by Dr. J. B. Herrick, professor of medicine in Rush Medical College, who found no other lesion except a nodule the size of a hickory nut in the epididymus, on the left side. This nodule the patient had been aware of for many years. There was no history of any venereal disease, and Dr. Herrick's opinion was that the nodule in the testicle might be of tubercular origin.

On examining the nose the following conditions were found: the nasal passages, especially on the left side, were quite roomy, presenting an appearance of moderate atrophy of both the middle and inferior turbinate bodies. The mucous membrane was distinctly congested and presented a dry, glazed appearance, but with no crusting or accumulation of secretion. On the septum the mucous membrane on the left side presented an unusual appearance. It was deeply congested and scattered over the surface were a number of discrete pinhead nodules. These were distributed widely over the septum. There were eight or ten of these nodules that could be seen by anterior rhinoscopy, and it seemed quite probable that there were still others located beyond the field of vision. The nodules presented a slightly grayish color, which made them stand out quite distinctly from the surrounding congested membrane.

The mucous membrane of the pharynx presented the typical pharyngitis sicca, but with no accumulation of secretions. The lateral bands were moderately swollen. The tonsils showed no evidences of chronic infection, nor was there a history of attacks of acute tonsillitis.

One of the nodules on the septum was located on the crest of a small septal spur, located near the floor of the nose, close to the entrance. This nodule was shaved off with a sharp scalpel and a piece a couple of millimeters in diameter was mounted in paraffin and sectioned. The specimen showed no break in the surface epithelium. Beneath the surface layer was the round cell infiltration typical of a tubercular process, in which here and there a giant cell was discovered. Efforts to find tubercle bacilli were not successful.

The clavicular gland on the right side was removed and turned over to Dr. Le Count, professor of pathology in Rush Medical College, for examination. His report was that the gland was the seat of a chronic tubercular process, in which he was able to discover a few scattered tubercle bacilli.

Under the direction of Dr. Herrick, the patient was placed on a regime best suited to combat tubercular disease.

The patient did not reside in Chicago but returned from time to time for observation. After several months he moved to Colorado, where he remained the greater part of two years, living in a tent. At the end of that time the enlargement of the cervical glands had practically disappeared. The annoying nasal symptoms had also disappeared. The only local treatment carried out during this time was regular cleansing of the nasal passages by means of a simple alkalin nasal wash and the application of albolin by means of an atomizer.

I have seen the patient occasionally up to the present time and he has continued to remain in robust health; no return of the nasal symptoms, the headache, nor glandular enlargement. The last examination was made March 13, 1920. At that time the nasal chambers appeared quite normal, and there was no distinct evidence of an atrophic process, which was present when he was first examined. The mucous membrane of the pharynx was also quite normal, with no evidences of dryness and no thickening of the lateral bands. The cervical glands were not palpable.

The question arises whether this was not a case of primary nasal tuberculosis, with secondary involvement of the lymphatics. One fact seems clear, namely, that the nasal involvement was not secondary to any pulmonary tuberculosis. The fact, too, that the evidences of tubercular trouble seemed limit-

ed to but one side of the nose suggests that the nasal membrane may have been the portal of entrance. It seems quite clear that the cervical adenitis was secondary to the nasal infection: first, because the nasal symptoms had been present for some time before the enlargement of the cervical lymphatics became apparent, and second, because the chief glandular trouble was on the same side as was the nasal disease. On the other hand, the presence of a number of tubercular nodules scattered widely over the nasal septum speaks rather against the origin of the trouble being in the nose, where we would expect only a single focus in case the nasal disease was the portal of infection. In view of the fact that the patient had a nodule, probably tubercular, in the epididymus, which was present for some time before his other symptoms appeared, it seems probable that this may have acted as the primary focus for dessimation of the infection, and that the miliary tubercles seen in the nose were secondary to this focus.

LVIII.

OBSERVATIONS OF THE HEALING PROCESSES FOLLOWING MASTOID OPERATIONS.*

By Philip Hammond, M. D.,

Boston.

It is still common practice to treat the operated mastoid wound by continuous packing. The old surgical adage of "allowing the wound to heal from the bottom" was dinned at us by our predecessors until we came to believe that it was gospel. No one needs to be told of the weeks, and occasionally months, required to heal a wound in this manner or of the resultant deformity from scar tissue.

Dr. Nichols has just shown us in an admirable manner what takes place in bone following operation or injury. It would appear that the repair processes are identical, whether the bone under consideration be the temporal or a long bone. It should be noted, however, that there is a departure from the common ground in the case of the mastoid, for we have in addition to our osteomyelitis accessory cavities through which the infection came. In most cases these cavities (the middle ear and antrum) are still actively involved, and one who attempts to deal with the mastoid surgically must consider their thorough and safe drainage.

Within recent years many mastoid cases, from one cause or another, have healed in an astonishingly short time. The writer knows of authentic cases of recovery in nine days; and perfect healing, or apparent healing, not infrequently occurs during the first two weeks following operation.

One of the earliest of the quick healing mastoids was observed by our late colleague, Dr. Clarence J. Blake, and it was this incident as much as any other that induced him to accept the theory of the "blood clot method" of operating. An operated case at the Eye and Ear Infirmary was so unfortunate as

*Read in conjunction with a paper by Dr. E. H. Nichols on "Bone Repair After Injuries and Experimental Operations."

to develop erysipelas practically coincident with the operation, and the mastoid wound remained unpacked and with dressings unchanged for some days. To the astonishment of all, when the wound was finally exposed, it had apparently healed by primary union. Independent research carried on by Sprague, Reik and others, established the fact that in certain cases, at least, early healing without packing was practicable. There was no denying the fact, however, that many mastoids so treated broke down, with resultant purulent discharge from the middle ear as well as from the mastoid. There also seemed no doubt that many of our worst secondary complications appeared in cases where the mastoid was prematurely closed, or partially closed, leaving unorganized blood clot or loose granulation tissue. Then, too, there was no provision for furthering the discharge from the middle ear by way of the antrum and mastoid; and there are anatomic reasons why it is impossible to render the middle ear aseptic. So, while we know that the vaunted granulating from the bottom is unnecessary, and that if the mastoid cavity were a simple opening into bone, easily sterilized, it might be closed over, allowing nature to finish the cure, we face an entirely different proposition. First and foremost, we must see to it that the discharge from the middle ear stops as quickly as possible, in order to conserve the hearing as well as to prevent reinfection of the mastoid. This duty should stand out preeminent above any theory or method that aims at the rapid healing of the mastoid.

It would appear, then, that this is the first thing we must accomplish in order to approximate the ideals which Dr. Nichols has just shown us. Of course, once we have overcome the infection, once the ear becomes dry, we are ready to start even with him, as if we were dealing with the long bones.

The writer believes that a gauze packing in the mastoid facilitates the escape of much fluid which otherwise must come through the auditory canal, prolonging the discharge. A wick should also be used in the canal. Occasionally, the ear will be dry inside the first twenty-four hours. Sometimes a bit of moisture will be apparent at the inner end of the canal for days. In any event, the gauze wick which has been inserted into the canal as far as the drum should be changed daily.

At each dressing the canal should be mopped dry and a fresh wick inserted. If the mastoid packing appears quite dry it is allowed to remain for five or six days, occasionally clipping a bit from the outer end if it has become dry and hard. Should the mastoid packing become very moist, even from serum, it would be better to remove it immediately and substitute a fresh packing. All packing should completely fill the space under treatment. In average cases the discharge from the middle ear ceases in from one or two days to a week. At about the end of the first week healthy fine granulations will begin to appear in the mastoid, the whole inner surface of which is visible at each dressing. Following the removal of the first mastoid packing, which is commonly of iodoform tape, plain gauze wicks are employed, taking the precaution, as above mentioned, to completely fill the cavity. This does not mean packing under pressure, however. This plain gauze is changed daily, and one can note the rapid drying of secretions from day to day. When at last the wicks are quite dry, about the tenth day, we are ready for our departure from the routine packing.

The writer would emphasize the importance of rigidly adhering to the details as outlined above, particularly as to the completeness of the packing. Time and again, following the insertion of a loose pack or wick, the mastoid becomes filled with purulent discharge, and frequently this condition can be cleared up by proper packing. If for any reason packings must be employed for so long a period that large granulations form in the cavity, the case will not be a favorable one for the next step.

Here we fall into line with the observations that have been pointed out by Dr. Nichols. We now have a middle ear which is no longer suppurative, and a mastoid cavity lined with smooth healthy granulations, practically devoid of discharge. Now if bone repair takes place along the periosteum and the endosteum, why not let these structures alone and allow nature free hand? This is practically what we do. The mastoid wound is completely filled with boric acid, a pad of gauze laid over the wound and the auricle gently but firmly held back against this pad by applying more gauze and a bandage. The next day the dressing is changed. No longer is a cavity visible in the mastoid. The cut edges have fallen close together;

there is a stain on the gauze pad, due to the liquefying of the boric acid, but no pus. Each day the gauze pad is changed, and in from five days to a week there will be a dry crust over what amounts to a linear scar, and the patient is well.

What has happened? No one for a moment believes that the mastoid is completely healed in such an incredibly short time. Neither is it healed after weeks of packing, if we may believe the results of Dr. Nichols' researches. Then we must fall back upon the belief that changes go on inside the mastoid for many months after the patient has been discharged as cured by the surgeon. What are these changes?

Long before the writer knew of the results obtained by laboratory experimentation on bones he had observed that patients who had been unfortunate enough to have the mastoid opened more than once, after an interval of months or years, frequently had such a firm thick cortex as to give rise to the suspicion that the former operation could not have been complete. On opening this dense bone, one uncovered a space in the mastoid, devoid of cells, filled with pus and granulations. Further observation showed that this was quite common, even where the wounds in the first instance had been packed until they "healed from the bottom." This began to look as if something were amiss in our theories regarding the healing of bone. If, despite persistent packing and firm granulations throughout the mastoid, ultimate healing leaves a solid cortex with an empty space under it, why pack? What becomes of the erstwhile solid granulations under the cortex? Here the laboratory man comes to our relief and tells us that they have changed to connective tissue, contracted, and so left the cavity. This would seem also to dispose of the question invariably asked when one for the first time sees a mastoid cavity filled with powder and allowed to heal over the surface. "What became of the cavity?" Nature would appear to have its own way regarding the healing of bone, and whether we will it or not, the cavity is bound to form and to persist. In the light of what we have seen shown as to what occurs in the long bones following operation, it would appear to be a logical conclusion that if we can deal with a fairly clean wound, the less we interfere the better. One of the things the attending surgeon must refrain from doing is to probe into the wound or

to insert a gauze wick to care for drainage. There will be practically no drainage if the above conditions have been fully met, and to tear through the newly forming cells beneath the skin is to do violence to a step in healing already well started.

Naturally there will be some cases that do not heal as they should. We still have to deal with infections of varying degrees of severity, and with patients who do not have the best of resisting qualities. If purulent discharge persists in such cases, it would be folly to attempt closing the wound.

A word as to the apposition of the edges of the mastoid wound. One expects more or less difficulty in keeping the edges well together, and frequently attempts to overcome this by secondary suturing of the wound. After prolonged experience with both methods the writer finds that, by attention to the suturing of the soft tissues at the original operation, the periosteum comes sufficiently well together so that there is a minimum of tendency to gape when the packing is left out.

These few observations are recorded here, not with the thought that anything new or startling has been developed, but that we may analyze our postoperative care of the mastoid in detail, and that we may so shape our treatment as to put as few stumbling blocks in the way of nature's cure as are consistent with the safety of the patient. For the axiom is as true today as it was in the time of Esculapius, "We dress wounds —God heals them."

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LIX.

CASE REPORTS.

1.—A CASE OF MILTIPLE STRICTURES OF THE ESOPHAGUS, APPARENTLY CURED BY REPEATED DILATATION WITH GRADUATED BOUGIES.

2.—REPORT OF A CASE OF SYPHILIS, VINCENT'S ANGINA AND SARCOMA OF THE PHARYNX, FOLLOWING EACH OTHER IN THE ORDER NAMED.

By Clement F. Theisen, M. D.,

Albany.

The first case I wish to report, one of multiple strictures of the esophagus, in a woman 51 years old, presented in some respects more difficulties in the way of treatment than any esophageal case I have ever had.

The patient was referred to me eight months ago, with a history of the inability to swallow anything but liquids, for the past year. The patient is a woman of average height, and before her esophageal trouble weighed 132 pounds. When she came to consult the writer she was reduced to 104 pounds and had a markedly cachetic appearance, so the possibility of malignancy at once suggested itself. The only thing she could think of that could have a possible bearing in causing the strictures was the accidental swallowing of a little of the fluid in a bottle of smelling salts, which contains considerable ammonia. About two years ago, she stated that she was using a bottle of smelling salts, while lying in bed, and got a little of the liquid in her mouth when she tipped the bottle too much. She did not think that she swallowed more than a teaspoonful. After drinking a good deal of water, the burning sensation and irritation gradually subsided.

The difficulty in swallowing came on very slowly, gradually becoming worse, until for the past year nothing but liquid

foods, and often with difficulty, could be swallowed. She was first given a barium bolus, the passage down the esophagus being watched with a fluoroscope. The bolus was arrested at the first stricture, apparently a fairly tight one. X-ray plates were then taken and briefly showed the following conditions: The X-ray plates showed five distinct strictures, the first about at the cricoid, where there is always some natural constriction, and the other four almost equal distances apart, the lowest being about 2½ inches above the stomach. The question of malignancy was probably settled by the X-ray plates, as no evidence of a growth could be seen. In order to positively confirm the diagnosis, a Jackson esophagoscope was passed, and the presence of the upper stricture confirmed.

As the patient was in such poor condition, no attempt was made the first time to get through the stricture. She was allowed to rest for several days, and then afer a good deal of difficuly a small, very flexible metal bougie was passed through the first stricture. This was done several times, before any attempt was made to get through the others. She was able to take a little more liquid nourishment, after the first few weeks and gained slightly in weight. During the next six weeks we succeeded in getting through the other strictures, the lowest one causing the greatest difficulties. Graduated metal bougies were used, beginning with small ones, and by the end of February, this year, we were able to pass a 13 mm. bougie, which is almost the size that should go through the normal adult esophagus. From this on the patient started to gain rapidly, and for the past three months she has gained nearly a pound a week. The last time I saw her, the middle of May, 1920, she weighed 129 pounds, almost her normal weight. She is now able to eat anything she wishes to, and takes three full meals a day without difficulty. The cachetic appearance has disappeared, and she says she feels perfectly well.

At the present time I pass an esophageal bougie, about every two weeks, and for the past two months have been able to use fairly soft flexible fiber bougies. The largest size passes to the stomach without any difficulty. During the first few months, when the metal bougies were used, there was occasionally very slight bleeding after the bougies were passed.

This happened only three or four times. After the first time a little olive oil was swallowed before and after the bougies were passed, and she has right along, for the last few months, taken a little of the oil before each meal.

The writer has had two other cases of esophageal strictures, both in adults, in the last few months. In both cases there was a history of the accidental swallowing of washing fluid, which contains a good deal of caustic potash.

Both these cases are doing well under the same plan of treatment used in the case reported today.

The statement was made in the title of this paper that the patient is apparently cured, and she certainly seems to be. We all, however, realize the difficulties of keeping the strictures dilated in cases of this kind, and a case cannot be called definitely cured until it has been kept under observation for a long time.

The second case is reported, not because of the rarity of any one of the three diseases, because all of them unfortunately occur frequently enough, but on account of the unusual combination of syphilis, Vincent's angina and sarcoma. It is the first time that the writer has observed these three conditions in the pharynx of the same patient. As stated in the title of the paper, they followed each other in the order named. It is possible that the syphilitic lesion and Vincent's angina were present at the same time, although Vincent's angina was not diagnosed for quite a while after a positive diagnosis of syphilis was made. The sarcoma developed after the Vincent's, and the progress of the disease could be carefully watched, as the patient was under the writer's observation continuously until he died.

This patient, a man, aged 38 years, was referred to me for an ulceration of both tonsils, that had existed for some time. On examination, we found a rather deep ulceration, almost covering the surface of both tonsils, which were large. The condition looked very much like a syphilitic lesion. No syphilitic history could be obtained, but the diagnosis of syphilis was proved by a Wassermann, which was positive. He had at this time only slight pain in swallowing. He was given a saturated solution of iodid of potash, and referred back to his physician, in his own town, for further observation. He wrote

me, after several weeks, that the ulcerative process was extending rapidly, in spite of vigorous antisyphilitic treatment. I then saw him again and found that the ulceration had extended to the mucous surfaces of the cheeks and gums, around the last molars, on both sides. The typical odor of Vincent's angina was now quite apparent, and the diagnosis of Vincent's angina was confirmed by the microscopic examination of smears from throat swabs. The patient was then given by his own physician five injections of salvarsan without the slightest result. During this time I saw him every week, and in spite of the salvarsan injections, and rapidly increasing doses of potassium iodid, the ulcerative process extended steadily. He was also given the local treatment, which is usually effective in cases of Vincent's angina, continuously.

Early in January of this year the edges of the extensive ulceration, which had now practically destroyed both tonsils, uvula and part of the soft palate, became very nodular and indurated, with a rapid extension of both the ulcerative and nodular process At this time he also developed a large, very hard mass, in the left side of the neck. Clinically the throat picture was fairly typical of an ulcerative carcinoma. A piece of the very firm nodular mass from the edges of the tonsillar ulceration was removed and sent to the laboratory for examination and was found to be a round celled sarcoma. He had from time to time rather serious hemorrhages from the erosion of blood vessels by the constantly increasing ulceration. The nodular mass, which broke down rapidly, extended to the base of the tongue, and finally into the larynx, and the patient died about the middle of April. I had not seen him for several weeks before his death.

This case is reported simply because of the unusual combination of diseases. The writer has seen the combination of syphilis and Vincent's angina a number of times, and it is of course well known that syphilitic ulcers make a very favorable soil for the development of Vincent's angina. This combination, in the writer's opinion, occurs much more frequently than is generally thought.

LX.

LARYNGOFISSURE FOR CARCINOMA, WITH DEMONSTRATION OF SPECIMEN.*

By Norval H. Pierce, M. D.,

Chicago.

Laryngofissure† should occupy a more prominent position among laryngologists in the surgery of the larynx than it does. The assumption of its proper position has been delayed by the advent of direct laryngoscopy.

Diagnosis.—Except in a very few exceptional cases specimens for microscopic examination of suspected cases of carcinoma of the larynx should not be obtained by indirect laryngoscopy. The soundness of this proposition is proven by a great many illustrations in literature, a notable one being that of the Crown Prince Frederick of Germany, where a piece was taken from a portion of the larynx, undoubtedly adjoining the carcinomatous growth, which proved to be a pachydermia laryngis. Even in the very best operative hands there is a certain inexactness in indirect laryngeal operating. This may be due to the operator or to the patient himself. The laryngeal mirror does not provide sufficient visual acuity for us to always distinguish the best place from which to excise our specimen for microscopic examination, and this might lead to the removal of a part that is not carcinomatous; we know that other conditions may coincidentally exist in the larynx with carcinoma. Then, too, it is impossible to get a large piece from the depth of the growth by indirect laryngoscopy, and this is a sine qua non for reliable microscopic diagnosis in cancer. The only method that competes with laryngofissure for securing diagnostic specimens is direct or suspension laryngoscopy. But

*Read before the Chicago Laryngological and Otological Society.

†Note.—These remarks relate to laryngofissure in connection with carcinoma only.

suspension or direct laryngoscopy should be employed only to make a diagnosis of the suspected tumor or to confirm a diagnosis by microscopic examination, that is all. It should not be employed for removal of the mass except in the rarest cases, where the growth is very small and superficial. In the large majority of cases that have undergone antisyphilitic treatment we can make a correct diagnosis by the laryngoscope, without microscopic examination. Suspension laryngoscopy for the purpose of confirming the mirror diagnosis of a malignant tumor is often an unnecessary ordeal. It is preferable to proceed at once, in many cases, with the laryngofissure and, if necessary at the time of operation, have the diagnosis confirmed by the freezing microtome. Otherwise, we are apt to temporize and waste time. The main considerations in treatment of suspected carcinoma of the larynx are early diagnosis and removal, and I believe that a laryngofissure provides the best means of doing this in selected cases. That means carcinomas that are small, intrinsic and limited to one side of the larynx. In 1,021 operations reported for the removal of carcinoma of the larynx by indirect and direct laryngoscopy, laryngofissure, and partial and complete resection of the larynx, in recent years, laryngofissure gives by far the greatest number of recoveries which have remained cured for a year or more. My own statistics, while embracing a small series, give a little over 50 per cent of recoveries living and without recurrence for over a year, in all cases of laryngeal carcinoma removed by laryngofissure. There can be no doubt that the condition of the patient after recovery from laryngofissure is infinitely better than that of the patient after total extirpation. The total extirpation patient is in a most pitiful plight for the rest of his life, depending upon a tube for air, and as a rule is despondent, whereas the patient with laryngofissure enjoys breathing through the natural channels, has a very good voice and is little incapacitated in any way. Laryngectomy should be reserved for large, obstructing, intrinsic laryngeal carcinomas.

Therefore, I make a plea for laryngofissure as the procedure of preference in the surgical treatment of circumscribed, early cases of carcinoma of the lateral walls of the larynx. It is preferable to direct or suspension methods, in my opinion, be-

cause, as I have already said in a paper read before the American Laryngological Association, laryngofissure gives us greater liberty of movement, better visibility, is as rapid, quite as safe.

There are several matters in the technic which might prove a subject for a fruitful discussion among men who have had experience. To perform the operation itself requires no special preparation. It is an easy operation. There are no blood vessels that will give us great hemorrhage. The parts are very superficial, and the points we may discuss are, first, tamponing the larynx; second, the use of the tracheal tube, whether it should be used or not; third, the use of the actual cautery, radium or X-ray, subsequent to operation, and the closure of the laryngeal wound immediately after operation. These are very practical questions.

I have had unfortunate experiences in cases where the tracheotomy has been done at the time of operation. Practically all my deaths have occurred in patients who have had a tracheotomy performed at the time of operation. The reason for employment of the tracheal tube dates back to the days when the operation was performed under general anesthesia. Now, the whole procedure is performed under local anesthesia. That gives an enormous advantage over the old days when I had the honor of assisting Christian Fenger. The whole aspect of the operation has changed since then. There is no longer danger of blood getting down into the trachea or bronchi during the operation. The patient's tracheal reflexes enable him to expel anything that goes down. In cases where the tumor is small a preliminary tracheotomy should not be performed. All the cases I have operated on without a tube, where the larynx has been closed immediately, have recovered partly because they were small epitheliomas. The hemorrhage from these operations is insignificant; the swelling is very slight. Here is another matter: In none of these cases which recovered did I use the cautery nor did I use radium. We should use a tracheotomy tube, only in cases where the denuded area is going to be large, in the cases where we are going to remove part of the interarytenoid region, and in cases where we use radium or X-ray. Recently I have been using the actual cautery in these cases.

Should the tracheotomy tube be placed in the trachea at the time of operation? I should say no. The tracheotomy tube should be introduced at least eight days before the larynx is opened, and it is a question whether we should use in all cases of tracheotomy local anesthesia or gas. In one of the cases it was remarkable how the infiltration anesthesia blurred the anatomic landmark. It is easier to do a tracheotomy with gas, so far as the operator is concerned, than with local anesthesia, especially where we have a short neck to deal with, the median lobe of the thyroid projecting well up, where we have to divide it, or dissect the middle lobe and retract it downward, because of the edema produced by the infiltration anesthesia. I believe the best way to proceed in these cases is to first perform the tracheotomy, making the incision from the hyoid to the jugulum, inserting the tube, stitching the upper and lower portions of the wound, and then, say about eight days afterward, when you wish to go into the larynx, the wound can be very easily ripped open over the larynx under infiltration anesthesia and the rest of the operation performed. The patient is then accustomed to the tube and to the new mode of respiration. I believe this is a better procedure than to introduce the tube at the operation on the larynx.

In opening the thyroid cartilage there is very little to be said. We may use an ordinary pair of heavy scissors, a curved bistoury, or, if partially or completely ossified, a pair of bone forceps or a chain saw. I do not believe that it is always necessary to divide laterally the thyrohyoid membrane. Undoubtedly it gives quite a little more access to the interior of the larynx to do this, but there is a danger of injuring the laryngeal nerve if we cut too far laterally, and this should be avoided. Once we are in the larynx and the growth is on the cord, we should begin by immediately dissecting up the perichondrium from the interior of the larynx beneath the growth, and after this has been elevated just as we do in a septum operation, then the growth should be excised, after which the cautery is used, not on the surface of the thyroid cartilage—this should be avoided—but simply sealing up the cut surfaces of the soft parts. During the use of the cautery we should be careful to protect the oppo-

site side of the larynx by means of moist gauze. The steam may burn the opposite side. We must also be careful to tell the patient to hold his breath while we are doing this, otherwise the heated steam may be inhaled and produce bronchitis. Great care should be exercised in retracting the edge of the laryngofissure. It is very easy to lacerate the edges of the mucosa of the larynx, fracture the thyroid or break off pieces on its cut edge, and this will seriously affect the postoperative course. A strip of mucosa should be allowed to remain along the cut edges of the thyroid cartilage whenever possible.

The next point is the matter of tamponing. It is unnecessary to tampon the larynx after laryngofissure for carcinoma. In cases, if I may digress a moment, of wounds of the larynx, where portions of the thyroid have become displaced, we usually have to pack in order to keep the parts in place, and because there is almost sure to be more or less suppuration, but not so in case of carcinoma. In the old days, when we used general anesthesia, the hemorrhage was very much greater and postanesthesia vomiting was to be feared, especially during the time the patient was unconscious. Now the patient is conscious; he can expel the secretion at any time and we do not need to pack for hemorrhage. On the contrary, packing is dangerous. Felix Simon reports a case, as does Schmiegelow, where the packing became displaced below the tube, causing asphyxiation. In one case, on account of the irritation produced by the packing, the patient coughed a great deal and produced a hemorrhage, which in turn induced a pneumonia. If packing is necessary, it should not be by means of a strip of gauze packed into the larynx, but by means of the Mikulicz tampon. However, in the operation under consideration packing should be avoided.

Usually we close the larynx immediately afterward. I believe we should even in cases where the actual cautery is used, because in cases I have observed, which are not enough to draw absolute conclusions from, but in the cases I have observed, the swelling, after considerable cauterization of the larynx, was insignificant. It did not produce stenosis. The case that furnished the specimen I showed here I left open.

If radium is used in these cases, then we must leave the larynx open, but I believe a certain number of fatalities will

result from leaving the larynx open. My experience leads me to the conclusion that the dangers incurred in leaving the larynx open greatly overbalance the benefits derived from radium. Deglutition is very much more difficult and painful in cases where the larynx remains open. Nutrition can, therefore, be much earlier maintained in cases where the larynx is closed. It is not necessary in these cases to put stitches through the cartilage. Deep stitches through the soft parts attached through the perichondrium, and superficial stitches of silk or catgut, are sufficient and they hold very well. As a rule, the larynx closes very kindly. The best way of preventing infection is to close the larynx immediately.

Here we have points that are open for discussion, whether we should use the tracheotomy tube, whether at the time of operation or before, whether we should use a tampon, whether we should close the larynx immediately, whether we should use the cautery, and if so, whether we should close the larynx immediately, or whether we should use radium, in which event we must leave the larynx open.

REPORT OF THE PATHOLOGIST.

The specimen shown was from Dr. Pierce's last case of laryngofissure. The patient was a man in the late fifties, who in July was treated for laryngitis because of hoarseness. The diagnosis was not made; the hoarseness disappeared, but in October, 1919, it recurred without any apparent cause. At that time a diagnosis by the indirect method was easily made of carcinoma of the left vocal cord. The growth measured about one inch or less in length and about one-half inch in width, and produced a tumor that limited the motion of the cord; it was hard, immovable and surrounded by a zone of hyperemia. The man should have recovered. Laryngofissure was performed, the growth excised, the base cauterized by the actual cautery and the patient was in the usual condition of these cases for about two days, when he had a chill and died of pneumonia. The demise, he thought, could be attributed to improper after-treatment.

Postmortem revealed a completely collapsed right lung, which they had thus far been unable to account for. There

was no connection between the tracheal wound and the pleural cavity. Saline solution had been injected under the mammæ, but no perforation in the chest wall could be found. Such a case was deplorable; the wound looked quite healthy. Below the tracheal opening was an area of necrosis caused by pressure of the tracheal tube.

LXI.

THE OCCASIONAL NECESSITY OF DOING RADICAL OPERATIONS ON THE PARANASAL SINUSES IN CHILDREN, WITH REPORT OF CASES.

By L. W. Dean, M. D., Iowa City, Iowa,

AND

M. Armstrong, M. D., Iowa City, Iowa.

With rather considerable experience in treating paranasal sinus disease in infants and young children, we have found it only very rarely necessary to perform extensive operations upon the paranasal sinuses.

We have found that much more readily than in the adult the chronic infections of the sinuses yield to simple treatment. Approximately eighty per cent of our cases have been apparently cured by the removal of adenoids and diseased tonsils. It is noteworthy that in no instance where the hemolytic streptococcus was the bacteriologic factor, has healing resulted from this procedure.

In those cases where the removal of tonsils and adenoids has not produced a cure, rather mild treatments with or without drainage and ventilation of the sinuses, have, as a rule, produced satisfactory results.

Some six months ago, in discussing the infections of the paranasal sinuses in infants and young children, we expressed the opinion that with children we would never do an operation on the maxillary antrum through the incisor fossa. Since then we have operated upon two cases by this route. We are firmly convinced that the exigencies of the situations and the results justified the procedure.

In doing these operations and also extensive operations on the upper posterior paranasal sinuses, we have not lost sight of the deleterious influence upon the development of the bones of the face that may result from the destruction of these cells in young children. We have always held prominent the very important functions of the nose and only as a very last resort

have injured structures that are essential to the performance of these functions.

We have had to deal with children with infectious arthritis involving practically every joint in the body, including the temporomandibular. This condition has progressed in spite of the removal of the tonsils and adenoids, drainage and ventilation of the paranasal sinuses and their treatment. We knew the ultimate outcome of this condition unless checked, namely, ankylosis of the joints with utter helplessness and death.

When we have had this condition to deal with and have proved conclusively that there was present in a paranasal sinus a virulent organism which when injected into an animal produced arthritis, and with prolonged treatment we have not been able to eradicate this organism from the sinus, then remembering the facts above stated, and after a most careful study of the case we have proceeded with extensive oprations. We have made every effort to preserve essential structures. In each instance the inferior turbinate has been sufficiently retained to carry out its function. It has been necessary in certain instances to sacrifice the middle turbinate. We have realized the very great need of preserving as intact as possible the inferior turbinate when the upper has been sacrificed. In this we have been very successful.

We are glad to report that where a Denker operation on the Highmorian antrum has been performed, all the teeth have remained vital.

The principal result of these operations has been the apparent healing of the sinus disease. The structures have no longer served as foci of infection. The joints have become quiescent; the pain in them has disappeared; the temperature curve has returned to normal; and, what is perhaps more important, the appearance of the patient has improved.

There is about these children, after the removal of the focus and the checking of the infection, something which is hard to describe. The listlessness which was so marked, and the expression of pain and depression disappears, and the child becomes bright and happy. The weight improves; the child enjoys play, something which he did not do before. The change is such that it justifies to us any necessary reasonable operative procedure.

Ordinarily we do not like to present case histories, as they are frequently long and tedious. We feel we can only illustrate the conditions we have had to deal with, and make plain the reasons for our doing these operations by presenting two such cases, and asking you to study them with us.

The two cases we are about to relate are two out of three cases from a very large series of arthritis cases in infants and young children, ranging from eighteen months to sixteen years of age, where we have found it necessary to do radical work on the paranasal sinuses. We have prepared two charts illustrating the temperature variations while the cases were being studied. Important bacteriologic findings are noted on the charts, as are also operative procedures.

Case 1.—R. F., referred by Dr. Steindler on January 5, 1919, for ascertaining the foci of infection. His diagnosis: Infectious arthritis.

Patient, white male, age 12 years. He is anemic looking; he is very thin; his appetite is poor; he is confined to his bed; he gives the impression of constant suffering. Almost every joint of the body is involved, including the joints of the cervical vertebræ and the temporomandibular articulation. The arthritis has been progressing for over two years. The joints are swollen, reddened and very tender. The pediatrist reports no involvement of the heart or kidneys. His daily temperature ranges from 98.8 to 100.2 degrees. He takes cold easily; he has no nasal discharge or obstruction; he has occasional attacks of sore throat; tonsils twice operated two years ago, resulting in improvement of his rheumatism.

Examination revealed a remnant of faucial tonsil on each side and a fair sized bunch of adenoid tissue in the nasopharynx. Cervical glands not palpable. There was a little mucopus in each side of the nose. The left antrum was blurred in the X-ray plate.

On January 10, 1919, the remnants of tonsils and adenoids were removed; the Highmorian antra were irrigated—the washings were reported sterile. From the tonsils a hemolytic streptococcus, a staphylococcus and the streptococcus viridans was recovered.

A rabbit injected intravenously with 1.5 cc. of a forty-four hour culture of the hemolytic streptococcus developed arthritis

in each shoulder joint. From the synovial fluid in the joints a hemolytic streptococcus was cultured. No gross changes were apparent in any of the internal organs.

The patient was returned to Dr. Steindler for observation, with the request that he be returned for further examination if there seem to be a focus of infection remaining.

On June 4, Dr. Steindler returned the patient to our service. He reported that while the condition of the patient was improved, he still has acute exacerbations of his arthritis, and the daily slight rise in temperature persisted.

Examination of the nose revealed the septum deflected to the left; left antrum of Highmore contained pus so thick it could only with difficulty be aspirated; the washings from the right Highmorian sinus showed no macroscopic pus. The bacteriologic examination of the washings from the sinuses revealed a hemolytic streptococcus from the right Highmorian antrum; a hemolytic streptococcus and a staphylococcus from the left. The hemolytic streptococcus from each fermented lactose and salicin; neither fermented mannite or inulin.

A rabbit was injected intravenously with 3 cc. of a twenty-four hour culture of a hemolytic streptococcus from the left antrum. It developed arthritis in the right elbow joint; also in the left ankle joint. The paranasal sinuses of the animal were negative on culture; the lungs and pleura were normal; there was fibrinous pericarditis; there were parenchymatous changes in the liver; the spleen and kidneys were apparently normal. A hemolytic streptococcus was cultured from the elbow joint.

On May 5, the deflected septum was corrected. The nose was treated, using negative pressure and nasal irrigations of normal salt. Patient was out of doors as much as possible.

Following this operation the patient's general condition improved, but the temperature and joint condition remained as before.

On May 23, the Highmorian antra were drained through the inferior meatus. The inferior turbinates were rotated upwards, and an opening made in the antromeatal wall. The turbinates were replaced and the operation completed without sacrificing any inferior turbinate tissue. The Highmorian antra were irrigated with sterile normal salt solution followed

by 1 per cent argyrol daily, and occasionally with 5 per cent silver nitrate solution.

One month later, on June 21, the patient insisted that the joints were better. His daily elevation of temperature to 100° persisted, however, and the appearance of the patient was bad. He had developed a bed sore which caused much distress. There was only a little discharge from the Highmorian antra.

At this time pus was detected coming from the region of the left sphenoid. The lingual tonsil had been frequently examined—it always appeared normal.

On June 23, 1919, the left sphenoid and left anterior and posterior ethmoids were operated. The sphenoid and ethmoids were badly diseased. The walls of the sphenoid were rough. A polyp was removed from the anterior ethmoid region. It was covered with columnar epithelium; it contained mucous glands; it was distinctly inflammatory, as shown by the large number of round cells below the basement membrane and around the blood vessels and glands; it was very edematous; the connective tissue cells have undergone mucoid degeneration. A very careful examination failed to reveal any definite evidence of involvement of the upper posterior sinuses on the right side. Consequently they were not disturbed. The nose was treated daily.

On August 23, the patient reports he is feeling fine; he can move his head better; the joints are not painful; there are no evidences of acute trouble in the joints. However, the patient looks bad; he gives the impression that he is gradually failing; daily afternoon temperature is between 100 and 100.4 degrees. The ethmoid and sphenoid regions are perfectly clean. The opening into the Highmorian antra are patent. Some mucopus is present each morning in washings from the antra. The washings still contain the hemolytic streptococcus.

On August 25, a Denker operation was performed on each Highmorian antrum.

Findings in the right antrum: Caries of the floor. Mucous membrane much hypertrophied. Three good sized polyps were removed. The polyps showed mucoid degeneration and marked purulent inflammatory changes.

The findings in the left antrum were similar to those of the right.

A hemolytic streptococcus was secured from each antrum. A rabbit inoculated with 4 cc. of culture twenty-four hours old became ill; it would not eat for two days; it gradually recovered; no arthritis was noted .

Following this operation the patient improved wonderfully. The temperature in five weeks became normal and has remained so except for the usual exacerbation present in bedridden cases in the children's ward.

His appearance has changed; he now looks well; he enjoys himself; his appetite is good.

The joints are quiescent; pressure on them does not elicit pain. Movements in the joints have increased spontaneously.

On November 26, he was transferred back to the orthopedic ward for the usual treatment for quiescent ankylosed joints. The sinuses are apparently well.

All of his teeth are vital. The only damage done to his nose is the removal of the left middle turbinate.

Case 2.—C. M., referred by Dr. Steindler on February 11, 1919, for finding the foci of infection. His diagnosis: Infectious arthritis. (See photograph.)

The trouble began during the preceding summer without apparent cause. The first thing noticed was a gradually developing of stiff knees with some tenderness. In December last, following influenza, the ankles and elbows became involved; the knees began to swell and were tender. The patient is now unable to stand on his feet because of pain in the ankles.

The patient is a white male, age thirteen years. He is confined to bed; he looks very bad, giving the impression of constant suffering. Almost every joint in the body is swollen and painful on pressure. The temporomandibular joints are involved so that the incisor teeth cannot be separated more than one-half inch. The cervical vertebræ are ankylosed, the head being fixed tilted to the left, with the chin pointing to the right. The daily range of temperature is from 98.8 to 101.2 degrees. The patient has no sore throat, hoarseness or cough. At times there is a slight cervical adenitis on the left side. No history of easily developing an acute rhinitis

or of nasal obstruction. There is considerable nasal discharge.

Examination: Nose, small spur right and left. Mucopus in each side of the nose; cannot be detected as coming from any definite region.

X-ray: Shows the Highmorian antra blurred—other sinuses clear.

Washings from antra, right, discarded because of an error in technic. Left, sterile.

Throat, chronically diseased tonsils—moderate sized adenoids.

Diagnosis: Chronic tonsillitis and adenoids with sinus disease not definitely diagnosed.

It was recommended that the tonsils and adenoids be removed and the patient placed under observation.

On March 18, the tonsils and adenoids were removed. From the tonsils a hemolytic streptococcus was secured.

On April 12, the patient developed an acute exacerbation of his arthritis and a second search for foci of infection was made. The daily elevation of temperature had been constant. The lingual tonsil appeared reddened; this seemed to be just a part of the general inflammation of the throat.

The nasopharyngoscope showed the neighborhood of the ostia of the upper posterior sinuses to be edematous and reddened. No pus could be seen coming from the sphenoids or posterior ethmoids.

Washing and aspiration of Highmorian antra gave from the right a bloody fluid; from the left, mucopus. Cultures from the right antrum were sterile; from the left, a hemolytic streptococcus was secured. Two cubic centimeters of a forty-eight hour culture injected intravenously into a rabbit developed in four weeks arthritis of the ankle joints.

An opening for ventilation and drainage was made through the inferior meatus into the Highmorian antra. The after-treatment was irrigation with sterile normal salt, followed by argyrol 1 per cent; occasionally 5 per cent silver nitrate was used. Coffin's treatment was given twice daily.

Two weeks following the operation the patient was no better; his appearance was bad; the daily afternoon elevation of temperature from one to one and one-half degrees persisted.

On April 30, the upper posterior sinuses were again examined. Mucopus, very thin, was found draining from each sphenoid region, along the posterior border of the septum. About the sphenoid openings the membrane was thickened and there were numerous petechial hemorrhages. There were some flakes of pus secured from each Highmorian antrum. Cultures from each antrum and the superior meatus on each side of the nose gave a hemolytic streptococcus.

Rabbits inoculated intravenously with 3 cc. of a twenty-four hour culture of the organism from the antra produced arthritis of the knee and shoulder joints. The hemolytic streptococcus was recovered from these joints.

On May 1, the sphenoids and posterior ethmoids were drained as thoroughly as possible without removing the middle turbinates, and the openings into the antra were enlarged. There was pus in each sphenoid. The after-treatment was the same as before. The patient developed an ear infection which complicated the situation for several weeks.

The diet was carefully watched and the patient was out in the sun on all favorable days.

A purulent discharge persisted from the sphenoid and ethmoid region.

On June 18, a hemolytic streptococcus secured from the Highmorian antra produced arthritis in a rabbit.

The patient's condition was gradually improving, but the daily elevation of temperature persisted, showing that the process was not checked.

On July 21, the patient developed an acute pharyngitis. The upper posterior sinuses were discharging mucopus.

On July 23, a Sluder operation was performed on the ethmoids and sphenoids on each side of the nose. It was found necessary to sacrifice the middle turbinates. Tissue removed from the ethmoid region showed increase in cellularity; many wandering cells, lymphocytes and polynuclear cells. Most of the surface was covered with columnar epithelium; at some points stratified squamous; and in some areas the surface is denuded of epithelium and covered with pus cells.

In four weeks the upper sinuses were clean, but the antra of Highmore still contained the hemolytic streptococcus.

On August 24, the patient was much improved; afternoon

rise of temperature to 100° persisted; sphenoid regions clean; some pus in each Highmorian antrum.

On August 27, a Denker operation was performed on each side and the lingual tonsil was cauterized.

Polyps and necrotic bone was found in each antrum. A rabbit injected with a hemolytic streptococcus secured from the antra of Highmore developed arthritis.

In six weeks the nose and sinuses were clean; the temperature was normal; the joints much improved. The patient has increased much in weight and says he is feeling fine. He spends much of his time playing.

From October 1 to November 28, there was no trouble in the nose or throat. The joints continued to improve.

On November 28, there was no tenderness of the joints on pressure, and the patient was returned to the orthopedic service, for the treatment of ankylosed joints.

Each of these cases had a negative Von Pirquet reaction. From each, material from the sinuses was injected into guinea pigs and no tubercular lesions resulted.

CONCLUSIONS.

1. Every case of arthritis in children that does not do well after the tonsils and adenoids are removed should have the paranasal sinuses examined, even if a previous examination has been negative.

2. If after nonoperative or operative treatment of the paranasal sinuses a focus of infection apparently persists in the sinuses, virulent pyogenic organisms should be sought in the sinuses, and if found more drastic treatment should be instituted.

3. If after careful prolonged study it is evident that only extensive operations will remove the focus of infection, then and then only should they be performed.

Case 1.—R. F.

Case 2.—C. M.

LXII.

NERVE BLOCKING FOR LOCAL ANESTHESIA IN TONSILLECTOMY.

By John A. Thompson, M. D.

Cincinnati.

Anyone familiar with surgical work under local anesthesia knows that more complete relief from pain can be obtained by blocking the nerve than by attempting to inject its terminal filaments. The posterior and external palatine nerves, which supply feeling to the anterior surface of the tonsil, can be easily blocked at their point of emergence, immediately behind the posterior palatine foramen. This point is just internal to the third molar tooth. The glossopharyngeal nerve also sends branches to the tonsil. The relation of this nerve to the tonsil was not shown clearly enough in any book on anatomy with which we were familiar to give us a definite method of blocking it. Prof. Knower of the University of Cincinnati kindly offered his assistance in determining this relation. The mouth of the cadaver was opened and the tongue depressed until the tonsils were clearly seen. The mouth was packed to keep the parts in this position, and the body hardened. An anteroposterior section was then made at the level of the lower third of the tonsil.

This special section shows that just outside the constrictors of the pharynx is a space of loose connective tissue which is continuous from the pharyngeal wall, outward and backward, surrounding the carotid arteries, hypoglossus, superior sympathetic ganglion and plexus, vagus and glossopharyngeal nerves. In this loose areolar tissue is found a rich vascular plexus with some large veins.

We can infiltrate this connective tissue space and block the glossopharyngeal nerve by one injection made external to the anterior pillar of the fauces, at the junction of the upper and middle thirds of the tonsil. At this point there is only mucous membrane to be penetrated by the needle. A large amount of a one per cent procain solution with epinephrin added should

be injected. We have used four drams of the one per cent solution for anesthesia. Ten minims is injected on each side of the palate and two drams in the connective tissue for each tonsil. Injecting here, there is no danger of thrusting the needle through a deep tonsillar crypt, carrying infection into the neck tissues with production of a cervical abscess. A guarded needle with one-half inch bare can be used. A preliminary surface application of a twenty per cent cocain solution makes the injection in the palate and pharynx painless.

It will be noticed that the vagus nerve is also in this connective tissue space. A number of experiments were performed in the laboratory of the University of Cincinnati by Dr. Tucker to learn whether or not the blocking of this nerve would have any harmful effect. Direct infiltration of the nerve with the solution produced no change in the heart rate or in respiration. The effect of electrical stimulation above and below the point of local anesthesia was the same as stimulating the cut ends of the nerves. There are some large veins in this connective tissue space. The direct injection of the solution, if a vein should be penetrated by the needle, was shown to be without danger by a series of experiments on dogs. Six decigrams of procain injected intravenously did not kill the dogs.

I have used this method in approximately two hundred tonsillectomies.

One very important point noticed is the small loss of blood. The injection of a large amount of fluid containing epinephrin into the connective tissue space stretches and contracts the vessels supplying the tonsil. The tonsil will be almost white when anesthesia is complete. When the stretched vessel is cut there is an immediate contraction and blocking of the vessel. It is not unusual to do a double tonsillectomy without loss of more than a dram of blood. Some cases bleed, but the amount of hemorrhage is not one-tenth as great as that under ether anesthesia.

The completeness of the anesthesia secured by blocking the posterior palatine nerve in the palate and the glossopharyngeal before it reaches the tonsil is hard to determine accurately because of the different mental attitudes of patients toward the operation.

One patient operated on fainted when the cocain solution was brushed over the palate before the injection was given. When she was revived the procain was injected and the tonsil removed with the Beck snare. She said the operation was painless. Many patients have made similar statements. In most cases, though, there is some pain when the snare is used as the final step in the operation. In cases where the Beck snare cannot be used the dissection is painless, but the traction on the tonsil when the snare is applied is painful. As this part of the operation takes only a half minute for each tonsil, the amount of suffering is not great and certainly less than that endured after ether anesthesia.

The anesthesia is much better than that we have obtained by injecting the tonsillar plexus. In patients where we have obtained anesthesia of the tongue, tonsillectomy is painless. Sometimes the removal of one tonsil is painless, while pain is felt in removing the other, showing that our technic is not quite perfect.

RECAPITULATION.

Both nerves supplying sensation to the tonsil region can be blocked by injection of procain solution.

Complete anesthesia is possible by this method.

The amount of blood lost is much less than with general anesthesia or where injection of the pillars is used.

The method is as free from danger as any surgical procedure can possibly be.

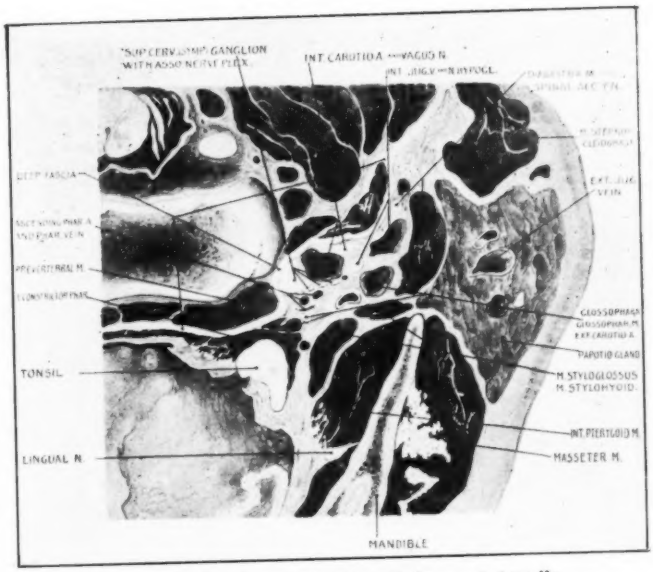

Fig. 1. Showing anatomic relations of tonsils.

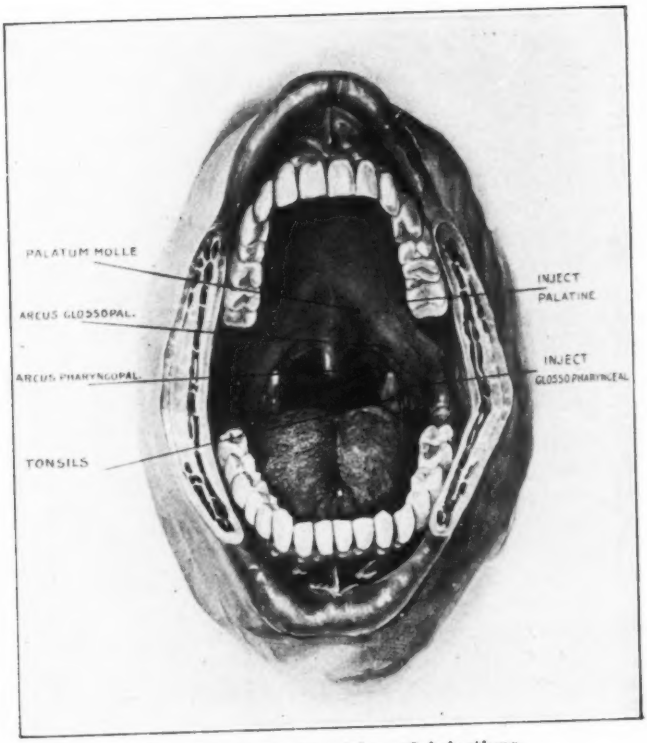

Fig. 2. Showing position of injections.

LXIII.

CASE OF UNUSUALLY LARGE FRONTAL SINUS.

By N. S. Weinberger, M. D., and Sydney Purkiss,

Robert Packer Hospital,

Sayre, Pa.

During the routine of hospital work we discovered an unusually large frontal sinus, or rather, sinuses. We delved into the literature on this subject, and although rather limited we gathered some very valuable and interesting material. We were especially interested in the comparative frequency of absence of one or both frontals and the average size of these sinuses in man. Many of us have undoubtedly diagnosed frontal sinusitis and even seriously considered operation and have been surprised when the skiagraph showed total absence of the sinus. We know that in a few instances serious mistakes have occurred. A. Logan Turner says: "One or both frontal sinuses may be absent. When we say the frontal sinus is absent, we mean there is no cavity extending into the vertical portion of the frontal bone. This does not, however, exclude the possibility that a small frontal air space exists between the two laminæ of the orbital plate. The frequency of this happening differs in different races." He examined 578 skulls in the anatomic museum of the University of Edinburgh. Two hundred and forty were Europeans as follows: Scottish, 124; English, 16; Irish, 20; French, 37; German, 13; Russian and Polish, 8; Swiss, 7; Greek, 6; Turkish, 3; Austrian, 2; Danish, 1; Flemish, 1; Italian, 1, and Spanish, 1. The largest pair seen in the Scotch were right 47 by 42 and left 51 x 53 mm. The smallest pair right 20 x 18 and left 16 by 13 mm. The average size of both cavities was 29.8 by 26.6 mm., the right sinus slightly larger than the left. Calculations based on examination of several hundreds of frontal sinuses represent a standard sinus as being 31.6 mm. in height by 25.8 mm. in breadth. As to presence and absence in 124 Scotch skulls: Both sinuses were present in 76.6 per cent;

both sinuses were absent in 12.1 per cent; right sinus absent in 4.8 per cent, left sinus absent in 6.4 per cent, making one or both absent in 23.2 per cent. The average size of frontal sinuses in 240 European crania was 33.5 by 28.7 mm., the largest being German. As to presence and absence in 240 Euroepan crania, one or both were absent in 17 per cent; of these, 7.5 per cent represents total absence. He finds the average depth of the frontals in 71 skulls to be 5.2 mm., the variation being from 2 to 16 mm., 16 mm. being exceptional. The sinuses were more frequently absent in female crania.

J. Parsons Schaeffer says: "The anatomy varies greatly in size, shape and type. Right and left are generally asymmetrical, and either or both may be present in duplicate or triplicate. He has seen four frontal sinuses on one side—each with an independent communication with the cavum nasi. Agenesis of the frontal sinus is most unusual in his studies. He thinks errors have been made in supposing it to be absent where there was no pneumatization of the frontal or vertical portion of the frontal bone, and that the frontal sinus in some cases never does invade the vertical portion of the frontal bone but develops wholly in the horizontal portion and is of the orbital type. In this class of sinuses any ordinary procedure to expose the frontal would ofttimes fail to reveal it. He describes a common type of duplicate frontal sinus, the simple sinus pneumatizing both the horizontal and vertical portions of the frontal bone. He thinks sometimes the sinuses remain so small as to be mistaken for agenesia and describes a dissection when the frontal sinuses were represented by two small cells well down toward the root of the nose, and their combined capacity was only 1 cc. He says the skiagram is valuable but not infallible in determining presence or absence of, and extent of the frontal sinus in the region of the forehead. When they are supernumerary, skiagraphy may be in error. Rhinoscopic examination is an invaluable supplement. One gathers from his experience that the frontal sinuses are rarely absent and that duplication and triplication are common; that if absent in the vertical position, it is usually present in the horizontal position of the frontal bone, hugging the ethmoid labyrinth and extending far into the roof of the orbit, both dorsally and laterally. He admits that the ethmoid

cells may develop far into the frontal region and in many cases might be classed as frontal sinuses, and that when there are two large sinuses on the same side of the frontal region it is hard to say whether they are both frontal sinuses or extensively developed ethmoid cells.

A. W. Meyer states that he thinks the entire absence of the frontal sinuses is probably not so rare as Schaeffer implies and doubts whether their absence is as common as Boege reports. Boege published an excellent summary of the literature and found bilateral absence of the frontal sinus in 4 per cent of 203 skulls examined.

Austin reports the case of a woman, 29 years of age, who suffered with pain over and behind the left eyeball for eight years, with discharge of pus from the left nostril for two years and recent swelling of upper eyelid. Examination showed pus came from region of left infundibulum and anterior ethmoid cells. He removed part of the middle turbinate and obtained temporary relief. The week before, he had operated upon another case similar to this and found a frontal sinus full of pus, so he cut down on this also. What he took for the anterior wall of the sinus seemed rather thick, and then to his surprise dura mater came into view. He explored the bone on both sides of the first opening, with the same result. The wound closed, healing by first intention. A subsequent skiagram showed absence of the frontal sinuses and, as he himself says, "A skiagram after operation was like shutting the stable door after the horse had bolted."

Goldsmith says that the complete absence of one or both frontal sinuses and frontonasal ducts is not unusual and exhibited the sectioned skull of a Canadian Indian to strengthen his contention.

Shambaugh claims that the absence of one or both is not unusual. He has about a dozen preparations showing absence of one or both and thinks the variation is as a rule bilateral. He never saw a large frontal sinus on one side and absence on the opposite side, but occasionally finds a small frontal on one side and absence on the other side. In contrast with these he has preparations showing an unusually larger sinus and considers them of practical interest because they are especially likely to become the seat of severe infections and if

operated upon externally are liable to cause a very disfiguring scar. We can at least gather from this that to operate upon the frontal sinus without a skiagram in addition to transillumination may sometimes prove a serious matter and involves a responsibility not to be lightly assumed. Even then there are times when it is very difficult to be certain about the exact conditions present. The skiagram may at times not enable us to distinguish between a large high anterior ethmoid cell and absence of the frontal sinus. It is at times well to introduce a probe and make the skiagram with the instrument in situ. Two good views should always be obtained, a posteroanterior and a lateral, and these should be at hand when the operation is being performed so that divisions and septa with blind pockets are not overlooked.

The patient whose sinuses are herewith reported came to us with oculomotor paresis, both internal and external, of the left eye, which proved to be specific. The photographs demonstrate the enormous size that the frontal sinuses at times attain. Should it be neecssary to operate upon a sinus of such size externally the patient should be previously informed of the deformity that would in all probability result. These sinuses show not only a very unusually high vertical portion but a very deep horizontal extension over the orbit, and one can easily see how severely adjacent structures might be affected in case of their infection.

Anticipating the fact that the accompanying photographs may provide material for discussion, we wish to give a brief outline of the method used in making the radiographs.

The posteroanterior view was made with the patient in the prone position face downward, nose and forehead resting on the plate, the tube being centered over the median line about one inch above the occiput at a distance of twenty-four inches, using a head clamp and compression. The lateral view was made with the patient lying on his left side, the tube being centered over the orbit at a distance of twenty-one inches, again using the head clamp and compression. In this view the upper brim of the orbits are shown to be slightly out of alignment, a fact which we surmise to be due to the shape of the head, making it difficult to get a perfect alignment under compression. Subsequent radiographs made of other

cases, using the same method with regard to distance, direction and position of the patient, have failed to reveal any magnifying of the parts taken when compared with the original, therefore we have no hesitancy in saying that the following measurements are true in all detail. The vertical portion of the sinuses, as shown in the lateral view, measures 3¾ inches or approximately 95 mm. The depth over the orbit measures 2¼ inches or 57 mm. The width from the median line measures 2⅜ inches or 60 mm. on the right side and 2¼ inches or 57 mm. on the left.

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Fig. 1. Lateral view.

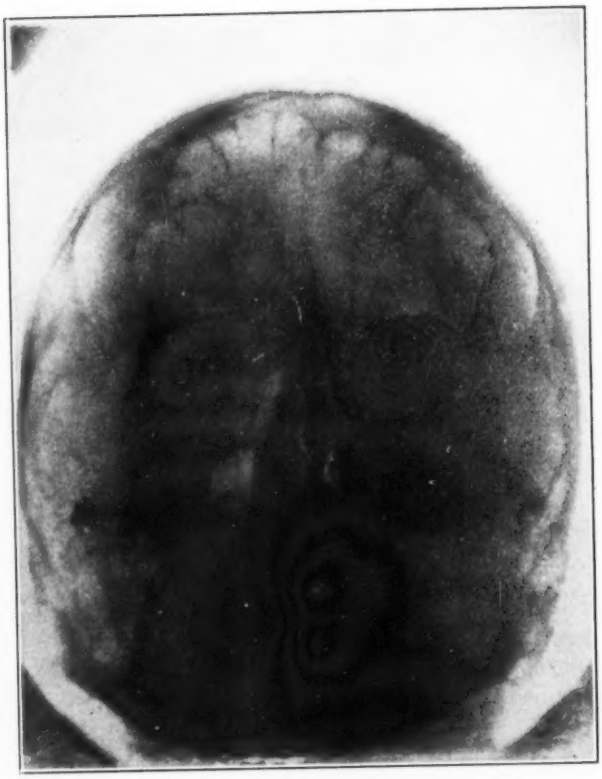


Fig. 2. Anterior view.

LXIV.

INTRANASAL DRAINAGE OF THE FRONTAL SINUS AND ANTERIOR ETHMOID CELLS.*

By Edwin McGinnis, A. B., M. D., F. A. C. S.,

Chicago.

Correct surgery should be founded on physiology and anatomy. It is on this basis that it seems to me some of the well known nasal procedures are wrong; for example, cauterization of septum or turbinates, while the submucous correction of the nasal septum is right.

Likewise, in the treatment of acute or chronic frontoethmoidal infections, we should consider two factors, the physiologic functions of the nose, and of the epithelial cilia of the mucous lining. Our efforts should be to aid nature in the restoration of the activity of the parts. As suggested by Smith, Wright and others, the functions of the intranasal structures are fourfold:

1. To warm the inspired air.
2. To moisten the inspired air.
3. To filter the inspired air.
4. Olfaction.

"They believe that the efficiency of each one of these processes depends to a very large extent upon the regulation of the vascular apparatus; that dilatation of the blood vessels, when it is not carried to a point of rendering the amount of air supply to the lungs inefficient, renders the air when it reaches the pharynx not only warmer and moister, and freer of dust and bacteria, but that by filling the unnecessary space in the respiratory region of the nose, it directs a more copious supply of it toward the olfactory regions."

The same authorities believe there is one point on which not enough emphasis has been laid, and that is the action of the epithelial cilia. "The cilia in the maxillary sinus remove

*Read before the Chicago Laryngological and Otological Society.

foreign material from its interior out through its natural opening. They cite in proof the fact that if the maxillary sinus of a dog is opened on its external surface the sprinkling of a few grains of carmine powder on the mucous membrane will be followed by its prompt appearance in the nasal chamber itself waved out through the natural opening by the cilia with which the membrane is supplied."

All of the sinuses, and part of the nasal mucosa are supplied by cilia. "The surface epithelium of the nasal mucosa is described by Wright and Smith as "ciliated columnar epithelium in the respiratory parts of the nose posterior to the vestibule and nonciliated above in the olfactory regions, where its various layers act as supporting cells for the cells of olfaction. This description is more accurate for children than adults. In adult life the flat celled epithelium is a common form in the respiratory tract, Oppikofer stating that in 200 cases exclusively columnar epithelium was found in less than 20 per cent over the turbinate bodies. In the majority of cases it is of the mixed type. It is idle to attempt to decide how much of this is due to the metaplasia of pathologic processes.

So in our operative work it behooves us to remove as little as possible of this necessary tissue. Many of the ideas and much of my enthusiasm for this work came through the opportunity of study with Dr. Harris P. Mosher of Boston. Long association in the practice of the late Dr. E. Fletcher Ingals of this city gave me a chance to study end results in all of the treatment and operative procedures in the nose. This study led me to the purpose of aiding nature, not handicapping her. All of the operations on the frontoethmoidal region sacrifice the middle turbinate, either in part or as a whole, except Max Halle's new operation, in which he raises a flap of mucous membrane in front of the anterior end of the middle turbinate; and Dr. Otto T. Freer's operation.

This field has been developed by the work of the late Dr. E. Fletcher Ingals, the first to develop a systematic plan of intranasal drainage. He was followed by Good, Halle, Mosher, P. Watson-Williams, Herbert Tilley, Segura, Vaccher and Sullivan, Sluder, Shambaugh and Otto T. Freer. The Lothrops of Boston have given us an internal-external operation on the

frontals only. It is interesting to find how these people working in the same field have come to the same ideas. In this work I have tried to simplify the procedure of operation so that anyone with a knowledge of the anatomy can get good results. This procedure is suitable for the simple acute as for the chronic cases, even those resulting in polypoid degeneration. In fact, these latter are the cases where it is especially good. The idea of aiding nature, not handicapping her, and leaving an area better suited to the needs of the individual than it was before operation is the purpose, then, of my plan of treatment. Furthermore, I have kept in mind the anatomic relations of the parts.

According to Skillern: "The frontal sinus embryologically is merely an offshoot from the ethmoid labyrinth. In the disarticulated frontal bone, the frontal sinus appears merely as a cavity divided by a septum. The ethmoid closes in these apertures from below, thereby forming the floor of the frontal sinus. It will thus be seen that the floor of the sinus is in reality a portion of the ethmoid capsule."

Skillern further says: "The anterior wall of the frontal sinus is composed of cancellated bone tissue and varies in thickness from one-sixteenth to five-eighths of an inch. The posterior wall is thinner, rarely exceeding one-sixteenth of an inch; however, it is composed entirely of compact bone tissue, which somewhat compensates for its lack of bulk. This structure forms part of the wall of the anterior cranial fossa and is in contact with the frontal lobe of the brain. The inferior or orbital wall is the thinnest."

Defects in all these walls have been found. The interior of the sinus has partial septa, occasionally almost complete septa. It is lined with columnar ciliated epithelium. Mosher states: "The frontal ostium is located at the posterior internal angle of the frontal sinus an eighth to a quarter of an inch from the medium septum, and is the upper end of the nasofrontal duct. The remainder of the drainage space of the nasofrontal duct is in the anterior ethmoid region. It may drain into an anterior ethmoid cell, or it may end in the unciform groove, or it may end under the anterior end of the middle turbinate above and distinct from the unciform groove."

Skillern has stated the location of the lower end of the nasofrontal duct to be

1. At the superior extremity of the infundibulum.

2. Anterior and superior to the hiatus semilunaris.

3. On the roof of the middle nasal passage, at the insertion of the middle turbinate. The frontal sinus may empty into an anterior ethmoidal cell. Onodi reports the occurrence of a double nasofrontal duct."

Mosher described "the ethmoid body as outside the cribriform plate, and as rising an eighth of an inch above it. It is bounded anteriorly by the posterior and inner surface of the ascending process of the superior maxilla, and by the posterior surface of the internal angular process of the frontal bone. Posteriorly, the labyrinth is in part free in the nasal cavity and in part united to the front face of the sphenoid sinus." The orbit lies to the outside, and the inner border is the turbinal plate of the middle turbinate."

My examination of many lateral nasal walls in cut sections of heads reveals something in the accessory sinuses that was illuminating to me The middle turbinate divides the ethmoids into an anterior and a posterior group. The sphenoid, of course, by its position, is in the posterior group. The sphenoid and posterior ethmoid cells drain into the sphenoethmoid recess. This recess is large, and as far as I can see there is very little to obstruct its lumen. The openings of the posterior cells are large, with nothing to obstruct their drainage. The anterior group, on the other hand, open into a space that has changing boundaries, with the middle turbinate overhanging it. The septum in this location is subject to great variations in thickness and in irregularity. The anterior ethmoids, frontal and antrum drain into this middle meatus. The upper ethmoid cells of the bulla drain backward high up underneath the middle turbinate into a space that is very easily obstructed. The antrum and frontal exits are in the immediate vicinity, so that infection in one cell means possible infection in all cells. Anatomically it would seem impossible for one sinus to be infected without involvement of all the others. So in the treatment of one sinus we have to take into consideration all of the middle meatus group.

The ethmoid cells are divided into anterior cells which drain in front of the insertion of the middle turbinate (middle meatus) and posterior cells draining behind the middle turbinate. The opening for drainage of the frontal sinus, anterior ethmoid cells and antrum are near together and are underneath the middle turbinate. The drainage we are proposing is for the frontal to drain forward and very much higher up; to cut through any cells in front of the unciform groove, and to open the front wall of the ethmoidal bulla, giving the upper cells two openings, one natural and the other acquired; and to open the front wall of the inferior cell of the bulla which drains behind insertion of the middle turbinate. This procedure relieves the congestion, as it were, in the middle meatus. The structure of the ethmoid body admits of this procedure, as it is made up of an eggshell like bone covered by its special mucous membrane. If you cut into the walls cleanly, the remaining walls stand up, and cut edges heal over perfectly. The result from this operation is to give gravity a chance to help the other measures of drainage. With this state of affairs the antral ciliæ are not so likely to be overwhelmed or to allow that cavity to be filled with pus from the regions above.

The frontal ostium is a definite ring like structure with a hard bony outline, lined with mucous membrane, and under ordinary circumstances is sufficient for drainage of its particular sinus. The obstruction to efficient drainage comes farther down in the anterior ethmoid region. In my plan of operation, we open the way as near to the ostium as we can, but no special effort is made to break into the sinus. This leaves the normal relations of the frontal sinus intact.

OPERATION—LOCAL ANESTHESIA.

In cases where the septum is so deflected or thick as to obstruct the ethmoid region, a preliminary submucous resection of the septum aids very much in the work. I do what I call a high submucous operation, bringing the ethmoid in view on both sides. In fact, it was this operation that opened my eyes to the ease of opening the ethmoid capsule.

1. Patient sitting in chair.

2. Application of adrenalin 1/1,000 on a cotton swab to the anterior end of the middle turbinate, and as high above this as you can go with comfort to your patient, and lastly, application to the septal mucosa opposite.

3. After shrinkage is complete, one more application of adrenalin on both sides of the turbinate and to the ethmoid bulla.

4. One application of cocain 20 per cent made to the surfaces above mentioned.

5. After waiting a few minutes proceed with the operation.

6. Patient's head in extreme extension. With Grünwald's forceps, bite into the mound of an agger cell if one is present or into the front of the ethmoid labyrinth above attachment of middle turbinate, leaving attachment intact. If there is one or more agger cells, part of the inferior and superior and posterior walls is cut away, and above these some of the front wall of the nasofrontal duct.

7. Next, with the same forceps, push the free border of turbinate toward the septum and bite through the front of the lower cell of the ethmoidal bulla; then bite a channel through the front wall of the bulla, thus opening all the cells. All cutting is done in an up and down direction, parallel with the orbital and turbinal plates. Patient is awake so that any pressure on orbital plate is felt by him and avoided by you. Under operation, four of my cases complained of pain in shoulder and side of neck, due to stimulation of sphenopalatine ganglion. I next try to pass a catheter into frontal sinus, and if I am successful irrigate it gently with warm sterile boric solution. In a few instances I have not been successful after two attempts in this, but the result has been good nevertheless.

8. I usually put a long strip of rubber sponge along the floor of the operated side of the nose, the posterior end of which plugs that choana with the front end well forward into anterior naris. Any hemorrhage will be anterior and gives patient less discomfort.

9. After-treatment, very simple irrigation of nose once or twice a day and an oily spray three or four times daily, containing thymol, grain 1/3, cocain alkaloid, grs. 3, menthol,

grs. 3, olei vaseline, oz. 1. I do not irrigate the sinus after day of operation.

I will cite a few characteristic cases:

Case 1.—A. E. B., dental student, referred by Dr. Shafer. Consulted me Dec. 27, 1918, with the following history: Dec. 15th, took cold and two days later had pain between the eyes and over right eye. No discharge at first, but after a nasal treatment Dec. 20th, discharge commenced the next day. Examination: Nose, septum irregular, tubercle thick; pus discharging from underneath anterior and right middle turbinate. Left naris, normal. Shadow over right frontal by transmitted light, other sinuses normal. Dec. 27th, 2 p. m., at the Presbyterian Hospital, under local anesthesia, I did this operation on the nasofrontal duct and opened an agger nasi cell. No packing. Dec. 28th, no headache or pain. Thin watery discharge. No pus seen on examination. Dec. 30th, no headache or pain, thin watery discharge, some pus in nose. Jan. 2, 1919, no pain or tenderness over eye, no headache, some mucopus seen in right naris. Jan. 9, 1919, no pain, very little discharge. Jan. 16th, felt very well, no discharge for two days. Transillumination: both frontals light up equally well. Discharged.

Case 2.—K., medical student. Headache and pain over left eye for two days. Shadow over left frontal by transmitted light. Other sinuses normal. Did intranasal operation. Passed eustachian catheter and sent to X-ray. Washed out frontal sinus with warm sterile boric solution. Saw him next day, headache very much less and in ten days the trouble had cleared up completely.

Case 3.—E. B., referred by Dr. Raulston; 48 years of age; agar maker; Jewish. Consulted me on August 16, 1919, complaining of headache, cough and loss of weight. Headache started four days before. He thought that it was caused by the cough. It was very severe at first, but had subsided, and he said that he felt it very slightly then. It began about ten o'clock in the morning and grew worse until he went to bed. He had had a similar attack 18 years before—had been treated at the county hospital. Sick about six weeks at that time. He had a left sided mucopurulent discharge. Examination: Leucocyte count, 21.600. Nose: Septum deflected

to the left. Slight purulent discharge from underneath anterior end of left middle turbinate. Nasopharynx normal. Tonsils normal. Larynx, trachea and base of tongue normal. Marked shadow over left antrum and left frontal sinus. Other sinuses normal by transmitted light. August 18th, cocain anesthesia. Shortened left nasofrontal duct and opened up anterior ethmoid cells and irrigated left antrum. Eustachian catheter through nasofrontal duct into left frontal sinus. Patient sent to the X-ray. No packing used. August 19th, patient said headache had entirely gone. Discharged from hospital. August 27th. Examination: Nose, no discharge from either side, and patient said he felt fine.

Case 4.—W. A. W., referred by Dr. A. Purves, Des Plaines, Ill. Nose stopped up and a purulent discharge from both sides. The late Dr. W. E. Casselberry had removed part of the middle turbinate on both sides, also on several occasions had removed polypi. Examination: Nasal polypi in both sides of nose. Septum thick and deflected to the left. Sept. 2, 1919, at Presbyterian Hospital, I did a submucous resection of the septum. Removed polypi with snare. Then did this frontoethmoidal drainage. Pus flowed out of bulla when it was opened. Usual after-care. Sept. 26, 1919, nose is fine, very little discharge.

In all, I have operated about sixty cases without any untoward results, no black eyes, no edema of the eyelids, no infections of the orbit, and, with the exception of one acute case of frontoethmoid and antrum infection, very little pain after operation.

In undertaking the treatment of a patient really suffering with acute or chronic frontoethmoidal infection, we are assuming a great responsibility. It is not a question of which method is used to get drainage, but of the condition of the patient's nose as a result of the operation. The ideal, of course, is the treatment that gets the patient well in the shortest possible time with a nose that functions better than it did before the beginning of the treatment. Our aim should be to treat our patients, as well as the condition, and to give them a better nose, instead of a handicapped one, as has been the unfortunate result in some of our work in the past.

1.

Forceps entering agger cell or anterior end of ethmoid just above anterior border of middle turbinate.

2.

Forceps biting up to the frontal ostium or into the floor of frontal sinus.

3.
Forceps entering front of lowest cell of the ethmoid bulla to bite a channel up the front wall of the bulla.

4.

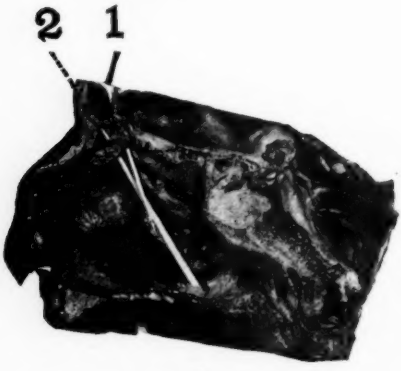
Forceps progressing up front wall of bulla until it reaches frontal ostium.

5.

Middle turbinate in position with forceps making cut in front wall of bulla.

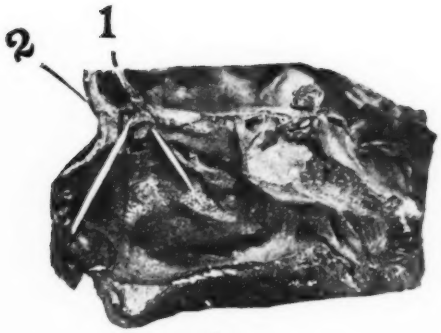
1.

1. Toothpick in new drainage way.
2. Toothpick in line of original nasofrontal duct.



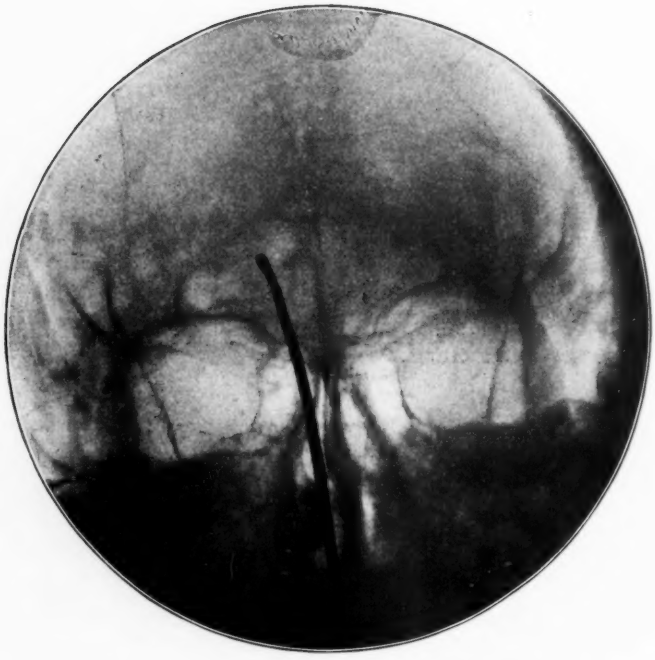
7.

1. Toothpick in nasofrontal duct.
2. Toothpick in an agger cell.



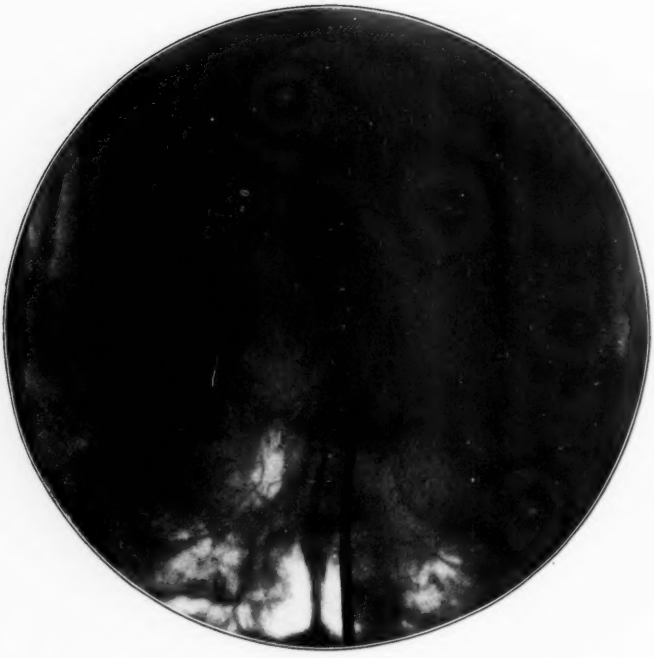
8.
1. Toothpick in nasofrontal duct.
2. Agger cell opened and toothpick into frontal ostium.

9.
Operated case—toothpick in the frontal sinus.

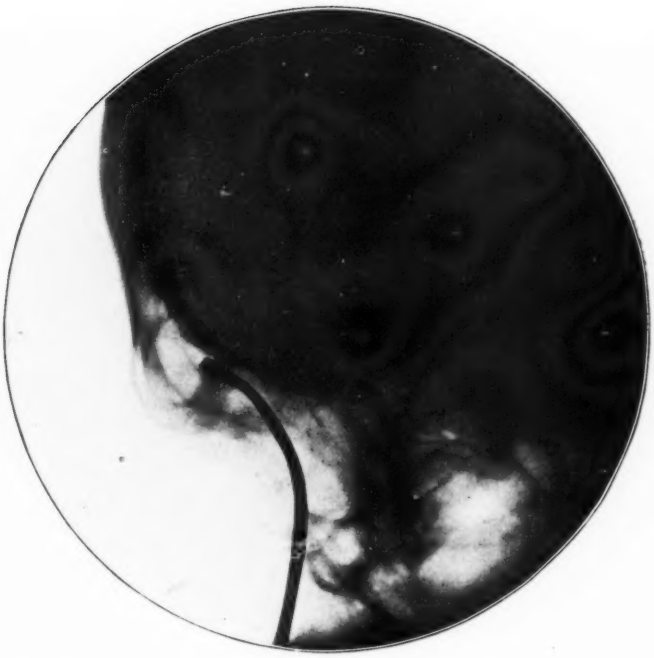


CASE 1.
Front view—Eustachian catheter in right frontal sinus.

CASE 1.
Lateral view—Eustachian catheter in right frontal sinus.



CASE 2.
Front view—Eustachian catheter in left frontal sinus.



CASE 2.
Lateral view—Eustachian catheter in left frontal sinus.

CASE 3.
Front view—Eustachian catheter in left frontal sinus.

CASE 3.
Lateral view—Eustachian catheter in left frontal sinus.

LXV.

A CASE OF EXTENSIVE OSTEOMYELITIS INVOLVING THE SUPERIOR MAXILLARY, MALAR, FRONTAL, ETHMOID AND SPHENOID BONES.*

By Ross Hall Skillern, M. D.,

The patient, P. S., age 28, came under my care on September 18, 1919, with the following history:

About the middle of July had an intranasal operation (spur of septum). One month later pain appeared in the right infraorbital region, radiating downward into the teeth. A diagnosis of purulent maxillary sinusitis was made and appropriate treatment instituted. Condition steadily became worse, and on August 29th an intranasal operation was performed on the maxillary sinus, which consisted of resecting a portion of the internal walls below the inferior turbinate. Slight relief for six days, when relapse occurred with edema over canine fossa, lacrimal region and inner canthus of eye.

On September 7th, the frontal sinus was opened through the inferior wall and drainage with gauze and rubber installed. Quantities of thick pus were evacuated. Patient did not improve and ten days later was received by us in the following condition:

Completely prostrated from long trip (Havana), having been quieted with large doses of morphin during journey. Intense pain in supra and infraorbital region. Face suffused and greatly swollen on right side both above and below eyes, and the eye itself closed from edema of lids with conjunctiva prolapsed from external canthus. Edema over frontal bone extended upward about five centimeters. Fistulous opening in floor of right frontal sinus at root of nose, containing rubber drainage tube, which was discharging considerable purulent secretion. In infraorbital region swelling intense, red and

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shiny, but no signs of fluctuation. Gums on upper right spongy, bleeding and bathed in pus. Marked bulging outward of canine fossa. Exquisite tenderness over all these areas. Profuse purulent discharge from right nostril and postnasally. Fever fluctuating between 100 and 102 degrees, pulse 90, respiration 26, and patient in a septic condition. Urine examination negative, blood 21,600 leucocytes (see laboratory report No. 1), X-ray taken (see laboratory report No. 2).

Instant radical surgical interference was, of course, indicated, so on the following day the maxillary sinus was opened through the canine fossa. The bone was softened and was easily removed, some portions fairly crumbling away when seized with the forceps. A quantity of thick and extremely fetid pus oozed out when the sinus was penetrated. A wide area of softened bone was removed until a large opening had been made into the sinus. On attempting to sound the cavity, it appeared to be filled with a soft, friable mass resembling disorganized brain tissue, which was more or less adherent to the walls. Malignancy was at once suspected, but careful examination, with the probe and finger, proved that the mass was not incorporated into any of the bony walls. The mass was removed piecemeal with the forceps and curette, a portion with the underlying bone being reserved for microscopic examination (see laboratory report No. 3. (Profuse hemorrhage accompanied all steps of the operation, due to the intense congestion of the parts. The cavity was thoroughly curetted to the bone, the nasal wall removed almost entirely and the alveolar fossa to the roots of teeth which were themselves removed (to canine). The softened bone of the alveolar process was resected until apparently healthy osseous structure was encountered. Cavity filled with iodoform gauze brought out through nose. The fistulous opening into frontal sinus was probed and enlarged by the operation, which had already consumed two hours and had to be terminated owing to the condition of the patient.

On the following day the temperature dropped to normal, but the infraorbital pain continued, although with diminished intensity. This condition lasted about ten days, the patient complaining more particularly of pain at night, preventing sleep. During the day he was for the most part fairly com-

fortable. In the meantime blood tests, including Wassermann, were again made (see laboratory report No. 4).

On October 1st, ten days after operation, the temperature shot up to 101°, and from that time the patient ran a septic temperature. The opening into the maxillary sinus through the canine fossa did not heal, but discharged large quantities of fetid pus. Localized areas of tenderness appeared over the face, notably over the infraorbital ridge and at the alæ of the nose. The alveolus where the tooth roots had been embedded was very sore, and the canine teeth felt unduly sensitive. Examination showed the alveolar process to be loose, which after slight manipulation was removed in two large sequesters (Nos. 1 and 2), the posterior being a portion of the antral floor, so that free communication now existed between the oral cavity and maxillary sinus. The septic temperature, however, continued and the general condition of the patient showed no improvement, so on October 20th the incision over the frontal sinus was enlarged and the left sinus opened. The disease had made great ravages in this region, both nasal bones with a portion of their attachment on the frontal bone came away in one sequester, the bone being badly necrosed (No. 3). The infection had penetrated the septum between the frontal sinuses, so that the anterior walls of both cavities were involved as well as the orbital wall of the right frontal sinus. The incision was extended across the root of the nose and through the eyebrow on the left side. The anterior wall of both sinuses, together with the septum, was removed and the cavities thoroughly curetted until all softened bone was apparently eradicated. Cavities packed with iodoform gauze and wound only closed at edges. The patient rallied, but still showed the septic temperature even more pronounced, and complained continually of feeling cold and inability to sleep at night.

The temperature gradually began to assume more normal characteristics, but the patient's condition still remained unsatisfactory. The swelling around the eyes and over maxilla appeared to be diminishing (see ophthalmologic examination), not so general nor tense, but certain small areas of great tenderness, notably directly under right eye and on the right side of nose, made their appearance. An incision was made under the right eye and a quantity of pus evacuated, the underlying

bone being found rough. This healed in a few days. The patient became progressively weaker, and the headache, which extended from the occiput to the frontal bone, while more or less quiescent during the day, reappeared every evening with such intensity that it was difficult to repress him in his bed. Morphin, even in ½ grain doses repeated, had little influence upon these paroxysms of head pains. It was perfectly evident that the case was steadily going from bad to worse and that something radical was urgently needed in order to bring about a change, if such a thing were in any way possible. In this forlorn hope, on the 17th of November, the supraorbital incision was extended downward along the nose, and on investigation it was found that the entire infraorbital portion of the malar was lying loose as a sequester, together with the ascending process of the superior maxillary. These were removed with the ethmoid cells and patient returned to his room. He reacted badly, the temperature rising above 103°. This condition persisted until he finally died on the 19th of general septicemia. Autopsy not permitted.

The particularly significant and instructive aspect of this case is the danger of applying inadequate therapeutic measures in the early stages of serious infection, particularly after it had begun to show a predilection for osseous involvement.

OPHTHALMOLOGIC REPORT.

When I first saw Mr. P. S., Oct. 20, 1919, there was marked proptosis of the right eye, with greatly swollen lids and marked induration of the same at the lower outer angle of the orbit. There was marked limitation of upward and downward motion: lateral motion good. Pupil was 3 mm. and responded well to light. The ophthalmoscope revealed a slight blurring of the edges of the optic nerve and overfullness of the veins. Vision was apparently good, fingers being counted without difficulty at 6 meters and the patient being able to tell the time on a watch held at the ordinary reading distance. The left eye was normal.

An incision was advised over the indurated eye, and on account of the condition of the surrounding sinuses and the orbital cellulitis a Killian operation was also advised. Notwithstanding the absence of pathologic evidence of malig-

nancy, the opinion was given that the possibility of there being a malignant growth in the orbit must be taken into account.

On Oct. 28, 1919, orbital condition much improved, Dr. Skillern having made a free incision and having given exit to a large quantity of pus at the lower outer angle of the orbit. Ocular movements somewhat freer; proptosis as before. No further ophthalmoscopic changes.

On Nov. 8, proptosis not so marked; ocular movements much freer, except below. Marked induration in floor of orbit; hard swelling continuous with the orbital rim being distinctly palpable. Vision as before. Ophthalmoscopically, edges of nerve perhaps a little more blurred and veins slightly fuller.

On Nov. 14, orbital condition improved. Exophthalmus not so marked. Ocular movements freer. Nerve not so blurred nor retinal veins so full as when last seen. Indurated area in the lower part of the orbit apparently not so pronounced. Now but slight swelling of lids and but little engorgement of the conjunctival blood vessels. Vision as before.

Laboratory Report No. 1. Blood, Sept. 19, 1919.—Hemoglobin, 95 per cent; erythrocytes, 4,170,000; leukocytes, 21,600; color index, 1 plus.

Laboratory Report No. 2. X-ray examination. Sept. 18, 1919.—Frontal sinuses negative. There is complete clouding of anterior ethmoids and antrum on the right side.

The posterior sinuses also appear to be clouded (see plates in stereoscope).

Teeth are negative. (Subsequent experience proved all upper teeth on right side badly infected.)

Laboratory Report No. 3. Tissue and Bone. Sept. 19, 1919.—Specimen consists of fragments of tissue, pale red in color. Fragments number five, two of which exhibit a fibroosseous nature. Three remaining pieces are hard and fibrous, apparently containing no bone, and are quite irregular.

Histology.—Softer sections are made up mostly of fibrous connective tissue, loosely and densely arranged. Along one border of two sections mucosa is observed, made up of stratified ciliated epithelial cells on a definite basement membrane. Below this, connective tissue exhibits an extensive exudate

of polynuclear and mononuclear leukocytes. Along other borders no mucosa is apparent, granulation tissue occurring, with blood vessels of new formation.

No evidence of sarcoma is seen in these sections.

Diagnosis: Chronic inflammatory tissue with areas of hemorrhage.

REPORT OF DECALCIFIED SECTIONS.

Sections are those of compact bone. Haversian canals surrounded by lamellæ, containing canaliculi, are quite definite.

Along one border there is resorption of bone, beginning in the Haversian canals, which in some places is quite marked.

These canals in which absorption is progressing are filled with an exudate of polynuclear leucocytes and some osteoblasts.

No evidence of malignancy is apparent.

Diagnosis: Bone suppuration (beginning) with slight absorption.

Laboratory Report No. 3a. Removed Tissue. Oct. 20, 1919.—Specimen consists of five tissue fragments; largest is 2.0 cm. by 1.5 cm. by 0.4 cm. Smallest is 7.0 mm. by 5.0 mm. by 3.0 mm. All are irregular. Color pinkish, mottled with red. Most of specimens contain bone at some part.

Histology.—Sections of largest mass contain no bone, mostly made up of fibrous connective tissue, fibers of which course in all directions; along one margin stratified columnar epithelial cells are present, with a suggestion of cilia. Along another border extensive leukocytic infiltration is present, most cells of which are polynuclears. Hemorrhage has occurred in certain areas of this.

Nearly all of smaller tissue masses reveal osseous tissue in sections. Fibrous tissue is extensive, and peripheral areas show leukocytic aggregates, most cells being polymorphonuclears.

In general sections resemble those studied from former tissue blocks.

Diagnosis: Granulation tissue with hemorrhage and necrosis. Chronic osteomyelitis.

Laboratory Report No. 4. Blood. Oct. 20, 1919.—Hemoglobin, 78 per cent; erythrocytes, 3,150,000; leukocytes, 20,000; color index, 1 plus.

Laboratory Report No. 5. Smears. Oct. 28, 1919.—Large number of streptococci; few pneumococci.

Laboratory Report No. 6. Blood. Nov. 4, 1919.—Hemoglobin, 89 per cent; erythrocytes, 4,100,000; leukocytes, 15,000; color index, 1.

Laboratory Report No. 7. Blood. Nov. 13, 1919.—Hemoglobin, 87 per cent; erythrocytes, 3,900,000; leukocytes, 13,200; color index, 1 plus.

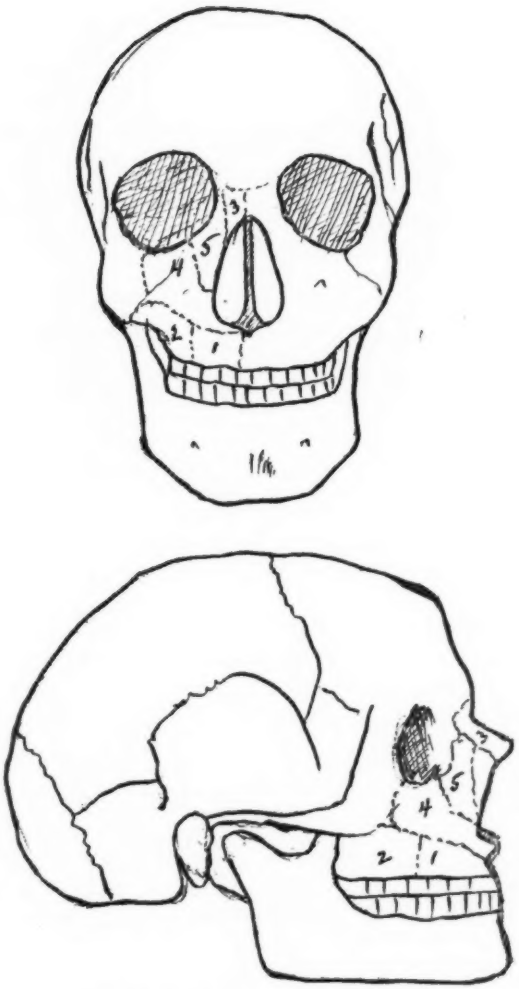

Fig. 1. Showing bone involved.

LXVI.

OBSERVATIONS ON THE MANAGEMENT OF TUBORRHEA. REPORT OF A SERIES OF TWENTY-FIVE CASES.*

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It is not generally recognized that the nose blowing habit and nasal pathology, other than suppurative processes, are causative factors in the continuation of tuborrhea in adult patients. By a tuborrhea is meant, in contradistinction to the suppurative processes within the middle ear and appendages, the tubal type of discharging ear which usually follows the acute suppuration in which a permanent patent perforation has resulted. The patient is not caused much discomfort, but the discharge is almost continuous.

Many admirable articles have appeared during the past decade showing the association of nasopharyngeal disease processes with suppurative otitis media, particularly in children. Barnhill, in discussing Reik's paper, called attention to the fact that not enough importance has been placed on the nose blowing habit as a primary causative factor of the acute inflammations of the middle ear. Patton suggested that 75 per cent of adult patients with a running ear have septal deflection on the same side. Murray says that "the clinical relationship of diseases of the middle ear to diseases and abnormalities of the nasal passages must be considered an indirect rather than a direct one. . . . An obstructive lesion situated low down in the nostril may so interfere with the expired air that the nasal secretions accumulate, and may give rise to a nasopharyngitis, or a violent expiratory effort in blowing the nose may drive the infected secretion into the eustachian tubes and cause involvement of the middle ear."

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He is inclined to believe that processes other than suppurative are not real factors.

Kerrison writes: "If we can satisfy ourselves that the discharge is simply the logical product of exposed mucous membrane or healthy granulation tissue, and that there is no evidence of an active suppurative process involving the bone itself, we should not be too ready to interfere with nature's method of conservatism." He suggests that an attempt be made to close the perforation and any nasopharyngeal complication cared for. To close a perforation, however, is frequently impossible. There is a large group of old cases of otitis in which the perforation is patent, and the middle ear epidermitized and dry.

Yankauer suggests that part of the function of the drum membrane may be protection to the middle ear from both the external and nasopharyngeal sides. His hypothesis is that if the connection between the nasopharynx and middle ear—that is, the eustachian tube—were closed by artificial atresia, in a large percentage of cases the suppurative process in the middle ear would become more amenable to treatment. Yankauer described a method of closing the tube which in certain cases has been successful and has prevented radical operations.

A timely discussion by Brubaker of the physiology of sneezing has recently appeared. The lower animals seldom have suppurative diseases of the ear and are infrequently deaf. Otitis media suppurativa acuta and labyrinthian involvement are occasionally experimentally produced by inoculation. The condition is metastatic. The only means an animal has of clearing the nose is sneezing. Man is prone to close off one nostril, however, and use great force in the endeavor to clear the obstructed side. The obstruction may be anatomic or physiologic, or a combination of both. If the obstruction is considerable, blowing in this manner completes the Valsalva experiment; in case there is a patent perforation in the drumhead the secretions are easily forced through the tube into the ear, since there is no column or air pad in the ear to resist the force. If the nose is blown without one nostril closed there can be no such pressure in the nasopharynx and consequently the force is usually not sufficient to drive

secretions into the ear. This is a clinical obstruction met with repeatedly in patients with what we call the "nose ears." In man both nostrils react to a sneeze at the same time. In animals the nasal orifice or eustachian tube lies relatively high in the epipharynx and is thus not so liable to be affected. This may be an important reason why animals are seldom affected.

Clinically "nose ears" or "tube ears" are quite readily recognized. There is usually an anterior perforation filled with mucopurulent secretion, frequently showing air bubbles, without appreciable odor. Occasionally a low grade involvement of the middle ear is found. It is not infrequent—in fact, quite the rule—that suppurative processes within the middle ear subside under well directed treatment when the infection in the tube is removed.

The history of the ear trouble is quite uniform. The onset is during childhood, after which there is more or less constant discharge, with occasionally quiescent periods, but the discharge is always greatly increased if the patient has a "cold in the head" or if the weather changes and affects the nasal membranes. The increased secretion coincident with acute rhinitis and physiologic activity incident to weather conditions causes the patient to blow the nose more frequently, and usually with great force, and if the nostril is not cleared easily, this completes the vicious cycle. Later, as the nasal condition resolves, the ear discharge becomes less.

ANALYSIS OF TWENTY-SIX CASES.

The group on which this report is based consists of 26 cases which have been observed by the writer. There were 20 men and 6 women, ranging in age from 20 to 54. Seventeen were in the third decade, 10 in the fourth, and 3 were more than 40. The initial causative factors in the process were as follows:

	Cases
Scarlet fever	8
Colds in the head	6
Measles	3
Swimming	2
Operation on the nose	1
Unknown	6

In all but one case the trouble started in early childhood.

Scarlet fever is ordinarily looked upon as the causative factor in more serious diseases of the ear; it is interesting that in this group it was the cause of the largest number. The perforation in cases of scarlet fever, when the rupture is spontaneous, is generally larger and less likely to heal because of the destructive nature of the disease process than in a case of ordinary infection.

It has always been my impression that physicians and the laity are too lax about treating earache in children, and that if the drum were opened earlier and more frequently, before so much intratympanic destruction takes place, a smaller number of cases of otitis media would need treatment later.

Contributing Factors After Onset.—The histories were quite uniform in that there was constant discharge of varying amounts and a marked tendency for it to increase with "colds in the head" or changes in the weather. The odor was offensive in few and in those it was due to neglect. The constant annoyance and inconvenience caused the patient to seek relief. All the patients were in the habit of blowing the nose forcibly because they could feel the air force the discharge out of the ear, which they had been told was desirable. A few purposely valsalvalized themselves for this latter reason.

Treatment After Onset.—Simple cleansing methods were used by most patients—that is, irrigation of the canal with various solutions. Two patients had had the socalled simple mastoid operation a long period after the onest and two had had the radical operation. Six had been tonsillectomized as a therapeutic measure. One patient had been constantly catheterized. Six patients had had the radical operation advised. This seems particularly significant. Many of the patients had never consulted an otologist.

EAR FINDINGS.

	Cases
Anterior perforation with mucopus	13
Central perforation without evidence of caries	7
Postinferior perforation with mucopus and granulations	3
Effect of radical operation with open tube	2
Evidence of attic disease plus condition in tube	1

In this group there was only one case in which we considered radical measures, and not without first giving the patient the "test of treatment." The condition in the ear at the time of examination in the clinic was not serious enough for concern in any of the other cases. The radical operation had been advised elsewhere in six cases. Immediately before coming to the clinic one patient with a large central perforation with healthy granulation on the promontory had been advised elsewhere to have a radical operation. Our opinion and treatment in this case were different, and the final result was satisfactory. One and one-half years after operation the patient was in good condition. Ordinarily a patient in this condition would be told to "go away and forget it and keep the ear clean." Such advice, however, does not satisfy all patients. The inherent danger is not marked, but the annoyance is considerable.

NOSE AND THROAT FINDINGS.

	Cases
Septal deflection with obstruction (varying amounts)	15
Pharyngitis, granular	6
Hypertrophic rhinitis	7
Infected tonsils	6
Previous tonsillectomy	6
Previous turbinectomy	1
Condition of nose negative	3

It will be noted that no patient had any suppurative process such as sinusitis. The septal deflection was the finding which in these cases proved to be pathologic for them. It is true that there is a large group of cases with septal deflection, with varying amounts of objective obstruction, in which there is no subjective complaint, but this does not mitigate the fact that what is pathologic for one patient is not pathologic for another, no matter how severe the obstruction. Few of the patients knew that they had any unusual condition within the nose. In most instances the nose had not been examined previously. Adenoids were not recorded in any case, although a nasopharyngeal examination was made routinely in all.

TREATMENT.

	Cases
Correction of the nose blowing habit	8
Correction of the nose blowing habit and local treatment	3
Correction of the nose blowing habit and operation on the septum	4
Correction of the nose blowing habit, operation on the septum and local treatment	5
Correction of the nose blowing habit, operation on the septum, local treatment and tonsillectomy	2
Correction of the nose blowing habit, tonsillectomy and local treatment	1
Correction of the nose blowing habit, operation on septum, Yankauer procedure and local treatment	1
Correction of the nose blowing habit, operation on the septum, Yankauer procedure and radical operation	1
Correction of the nose blowing habit, local treatment, Yankauer procedure and radical operation	1

By correction of the nose blowing habit is meant instruction of the patient in blowing the nose without closing either nostril. In eight patients who have learned to blow the nose properly the process became dry without other treatment; one of the patients had been advised to have a radical mastoid operation. Local treatment consisted in mechanically removing the secretion with cotton applicators or suction; fluids were avoided if possible. This was followed by drying the cavity with air, instilling boric acid and alcohol drops solution and again drying with air. It will be noted that there were thirteen operations on the septum, one-half the number of cases of the group. In one case it will be observed, the Yankauer tube instrumentation was required before the ear became dry. In one of the two cases in which the radical operation was required a previous radical operation had been performed elsewhere, but there was a continuous tuborrhea and the patient was very apprehensive. The tube in this case was so large that the largest Yankauer curette was admitted easily. There were a number of hypotympanic and tubal cells which had not been opened previously. The final result was satisfactory; the patient has been examined several times since dis-

missal and the ear found to be dry. In the other case in which the radical operation was done all conservative measures were first used. The patient remained under observation about eighteen months; the radical operation was then performed. Hypotympanic and tubal cells were found in this case also. The result was satisfactory. There were four cases in which the habit of forcefully blowing the nose and the deformed septum were corrected without the use of local treatment. One of the patients had been advised elsewhere to undergo the radical operation. He had consulted a well known otologist, who scoffed at the idea that correcting the septum would have any effect upon the ear. This is the case which aroused my interest in the group.

The radical mastoid operation had been advised elsewhere in six cases, but not in the two cases in which we operated. It will be recalled that this group is made up of adult patients with tuborrhea who ordinarily are dismissed with the advice that treatment is unnecessary, but in whom the ear frequently can be dried up. In the case in which attic disease was a complication of the tuborrhea the ear has been much improved, but at two subsequent examinations evidence of an active attic process was found. This patient has not been able to remain under observation.

The ear in cases of tuborrhea becomes dry in a strikingly short time, as short as five days in the patients whose definitely fault ynose blowing habit is corrected, and nasal obstruction on the same side as the involved ear removed.

Exacerbations have been observed in a few patients with tuborrhea during an acute rhinitis, but the discharge has subsided without other measures than care in blowing the nose.

CONCLUSIONS.

1. Tuborrhea is frequently the result of the habit of incorrectly blowing the nose.

2. Pathologic conditions other than suppurative processes, particularly anterior nasal obstructions in adult patients are indirect causative factors.

3. Frank inflammatory processes in the nasopharynx were not observed in the twenty-six cases studied.

4. Clinical classification of suppurative conditions of the middle ear is important.

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LXVII.

MENINGITIS DUE TO FRONTAL SINUS SUPPURATION, WITH A REPORT OF THREE FATAL CASES.*

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Philadelphia.

There is no more important phase of rhinology and none which is worthy of more serious thought and study than that of inflammation of the nasal accessory sinuses and their serious complications. Our knowledge in regard to the treatment of sinusitis leaves much to be desired, and it seems advisable to report our successes and still more our failures, so that, eventually, evidence may be at hand for the drawing of correct conclusions in regard to the prevention and cure of dangerous complications.

Considering the vast number of cases of sinus suppuration which are being treated, or are getting on without treatment, the number of reports of intracranial involvement from them are relatively few, and in searching the literature one is impressed by the number of intracranial cases of otitic as compared with those of nasal origin. That these complications of sinus inflammation are not common is borne out by statistics. Treitel[1] reported from the Berliner Pathologischen Institute that he found but one case of meningitis and two cases of brain abscess from frontal sinusitis in 6,000 autopsies, while Pitt,[1] in 9,000 consecutive autopsies at Guy's Hospital, in the years 1869 to 1888, found but one case of rhinologic brain infection and that was an abscess in the frontal lobe. However, the thoroughness with which he studied the sinuses has been questioned. More recently, in 1909, Bruhl[2] states that in an observation of 35,000 nose, throat and ear cases during the previous ten years, he saw a great many otitic fatalities from pyemia, brain abscess and meningitis, and only one case

*Read at the meeting of the American Laryngological Association, May 29, 1920.

of intracranial disease from frontal sinus suppuration, while Jansen,[3] with an operative experience of 800 cases, reported three of purulent meningitis, without operation, about six of large extradural abscess and one of serous encephalomeningitis. In the same year Gerber[4] published an exhaustive report of frontal sinus complications collected from the literature, in which he tabulated 51 cases of meningitis without brain abscess, six of which had had sinus thrombosis; and 65 cases of brain abscess, 27 of which also had meningitis and two had thrombosis. In 1913, Boenninghaus[5] was able to collect only five additional cases of purulent meningitis due to frontal sinus suppuration, thus bringing the total to 56. Since that date we have found five more cases, the references to which are included in the bibliography of this paper—6, 7, 8, 9 and 10. Some of the recent foreign literature has been inaccessible because of the war, and no doubt unreported cases have occurred.

Meningitis may complicate either chronic or acute sinusitis, is more common in the male sex and during the second and third decades. Gerber[4] reports three under ten years of age and the same number over sixty years. It usually starts over the silent area of the brain, and the symptoms may be obscured by those due to the neighboring sinusitis or the orbital complications. Usually it runs a rapid course and terminates fatally within five days, although the symptoms may be intermittent or the course prolonged. In one of our cases, herein reported, the pathologist estimated that localized meningitis had been present for six months. In this case both fever and leukocytosis were absent.

The infection may be transmitted through a congenital or a carious defect in the posterior wall of the sinus, through the veins or lymphatics, by infection of the diploe or by the formation of an osteomyelitis.

In 1913, Zwillinger[11] demonstrated that colored fluid, injected into the perimeningeal lymph spaces, could be recovered in the lymphatic plexuses of the mucous membrane of the frontal sinus. Furthermore, it has been shown that the veins of the sinuses communicate with each other and through the bones with the meninges and the cranial sinuses. The relative or absolute closure of the nasofrontal duct may be a

factor in some cases. It has been stated that the larger the frontal sinus the greater the danger of intracranial complications.

After purulent leptomeningitis has developed, the prognosis is very bad. Only three of Gerber's fifty-one cases recovered and two of these were serous meningitis. A few cases of purulent meningitis have recovered—e. g., Beck[12] reports the cure of a case of otitic origin in which pneumococci were found in the cerebrospinal fluid. The Haynes operation was performed in this case. There is considerable evidence to show that the mortality has been increased by operations on the sinuses—e. g., Boenninghaus[5] reported a mortality of ten cases following 375 Killian operations, or two and two-thirds per cent. He collected fifteen cases of death from intracranial complications which were the direct result of the Ogston-Luc operation on the frontal sinus. Four of these cases died from meningitis in from two to six days after operation, one from subdural abscess and sinus thrombosis eight days after operation, eight from osteomyelitis in from seven weeks to two years after operation, and two from brain abscess. In 1909, Hajek[13] reported two postoperative fatalities and stated that Gerber compiled a series of thirty-six. These statistics are by no means conclusive, as many cases have not been reported—e. g., Hajek speaks of six cases reported privately.

As there is considerable operative risk, the cosmetic results are not always satisfactory and complete cure is uncertain, many surgeons hesitate to do a radical operation unless intracranial infection is suspected or the bone is diseased. Even conservative surgeons agree that one must not hesitate beyond this point.

The following case illustrated the value of even a late operation: About two months ago I operated on the left frontal, ethmoidal and maxillary sinuses of a 14-year-old boy who had marked proptosis of the left eyeball. On operating we found the dura exposed in the ethmoidal and frontal regions with a local meningitis. The roof and inner wall of the orbit were largely destroyed, and staphylococci were found in pure culture. The patient has shown no evidence of extension of the intracranial involvement. The Wassermann test was negative.

The results were not so fortunate in the following cases:

Case 1.—On December 18, 1918, Dr. L. asked me to see his 14-year-old son, who had been suffering for about two weeks from an acute inflammation of the left frontal sinus with swelling and tenderness. He had had an attack of influenza during the latter part of September, from which he seemed to recover, with the exception of a condition of malaise. He became exhausted on the slightest exertion and did not look well. Previously he had been a normal, healthy boy.

As I saw him in his home, my examination was incomplete. However, there was neither tenderness nor swelling over the sinuses, the postural tests were negative and there was no abnormal scretion in the nose or throat. I suggested a blood count, an X-ray examination of the sinuses and examinations by an ophthalmologist and a neurologist. The roentgenologist could not determine whether the left frontal sinus was absent or full of exudate. The blood count showed 20,000 leucocytes. The neurologist, Dr. William G. Spiller, examined him two days before he died and gave a negative report.

I urged his father to send him to the Lankenau Hospital for study, as the cause of the leucocytosis and weakness had not been determined. He was admitted to the hospital during the evening of December 20th, but I was not notified of his presence until the following forenoon, when I received a telephone message that he had become unconscious the previous evening and showed signs of meningitis. Drs. Spiller, Page and I saw him in consultation at 2 p. m. on the day after admission. He was comatose, the neck was stiff, the pupils did not react to light and accommodation. The left one was widely dilated, the right contracted, and there was a hemorrhage in each fundus. The examinations of the ears, lungs, heart and abdomen were negative. The right arm and leg showed spasmodic twitching. The Babinsky was present in the right foot, both patellar reflexes were slightly increased. Kernig's and Brudzinski's signs were positive.

The blood count showed hemoglobin, 90 per cent; red blood cells, 4,870,000; white blood cells, 26,300; polynuclears, 72; lymphocytes, 11; L. mononuclears, 10; transitionals, 7. The cerebrospinal fluid was cloudy and showed a count of 226, mostly red cells, and Gram positive diplococci resembling pneumococci. On admission his temperature was 99, pulse 60,

respiration 20—the following morning 100.5, 70 and 20. A second X-ray examination showed an exudate in the left frontal sinus. All agreed that the sinus should be opened. This was done, and it was found to be filled with thick brown fluid. The mucous membrane was moderately inflamed, the walls were intact, and the nasofrontal duct was patulous. The patient required little ether and the pulse and respiration were normal during the short operation. While the wound was being sutured the patient suddenly stopped breathing, probably from paralysis of the respiratory center. Efforts at resuscitation failed. No autopsy was obtained.

Case 2.—T. D., age 21 years, native of Poland, came to the eye clinic at the German Hospital, September 30, 1908, and was referred to the nose and throat department by Dr. W. T. Shoemaker.

The patient gave the following history: He had been kicked by a horse above the right eye 14 years ago. Three months later he noticed a swelling over the inner end of the eyebrow, which slowly increased in size. There were no symptoms except moderate bilateral "dizzy" headaches in winter time and loss of the sense of smell on the diseased side.

Examination showed a swelling about as large as a pigeon's egg along the inner end and extending below the right eyebrow. There was no tenderness. The periphery of the elevation was hard and bonelike, the center doughy and cystic.

The appearance of the inside of the nose was practically normal except that there was crowding of the middle turbinal on the right side caused by the moderate inward bulging of the external wall of the nose. There was some yellowish nonfetid secretion in the left anterior nasal chamber and in the nasopharynx. Sense of smell was lacking on the right side. Transillumination showed both frontals dark. The skiagraph was unsatisfactory. The eyes were normal.

Diagnosis of mucocele of the frontal sinus was made.

October 2nd, after removing the anterior end of the middle turbinal, we opened the frontal sinus and found the cavity very large, measuring two inches in the anteroposterior as well as the lateral diameter. The cavity was filled with thick, ropy mucus. There was no communication between the sinus and the nose, therefore a very large passage was made and a

rubber drainage tube was inserted, one end being left in the incision in the eyebrow while the rest of the incision was closed with sutures.

The patient did fairly well, and the drainage tube was removed from the wound in the eyebrow at the end of a week, and ineffectual efforts were made to keep the internal portion in situ. However, in spite of persistent attempts to keep it open with bougies and tubes, the artificial duct closed and the swelling reappeared.

On October 29th, I reopened the wound in the eyebrow and found the sinus nearly filled with flabby granulations and some thick mucus. I then inserted a gold tube with a large flange, treated the granulations with silver nitrate and closed the external wound. The patient made an uninterrupted recovery with marked improvement in his mental condition.

Four years later, December, 1912, he came to my office with an acute purulent infection of the right frontal sinus with drainage of pus through and about the gold tube which was still in place, surrounded by granulation tissue. After a few treatments he improved and then disappeared from my observation for another four-year period when, in the summer of 1916, he returned with a recurrence of acute symptoms. He refused to go to the hospital in spite of urgent advice, and I did not see him again until June, 1917, at which time pus was coming through the upper eyelid and the tube was badly blocked. He still refused to go to the hospital and failed to report for treatment.

About a month later I was called to his home by his family physician and found him with a typical attack of meningitis, from which he promptly succumbed. It was impossible to do even a lumbar puncture in his squalid surroundings and in the presence of a dozen or more of his Polish friends, and the family refused to allow him to be taken to a hospital.

Unfortunately an autopsy was unobtainable.

Case 3.—F. S. was admitted to the Polyclinic Hospital December 9th, 1912. He was large, well proportioned and looked much younger than his age of 77 years. During the past seven years he had been a night watchman and previously a glass-blower. His chief complaint was loss of vision and a discharge above the right eye. For the past two years he had

had a bilateral, intermittent, creamy yellow anterior nasal discharge. During the last six weeks he had had three attacks of swelling of the right cheek and bilateral swelling of the eyelids. During the last attack he used poultices, following which a fistula formed over the right eye, and through this there had been a discharge of pus. Three weeks previously he had had polyps removed from the right nostril. He had never had pain. With the exception of a loss of forty pounds in weight during the last two years, dyspnea on exertion and occasional swelling of the feet, the rest of the general history was negative. He denied venereal disease.

The examination showed tenderness over the floor of the right frontal sinus with induration of the tissues of the upper part of the right orbit and a supraorbital fistula extending into the frontal sinus from which pus was draining. Both nostrils were filled with pus which could be traced on the right side to the middle meatus. The right middle turbinate was large and polypoid. The view of the left naris was obstructed by a deflected nasal septum. There was no pus in the pharynx and the choanæ were free. A culture of the pus was sterile. The X-ray examination showed marked clouding of the right frontal and roughening of its median wall, with slight clouding of the right antrum and of the ethmoids on both sides.

On the 11th of December, 1912, the right middle turbinal was removed and pus was washed from the right antrum.

Dr. Reber reported the external ocular muscular movements good, incipient cataract, haziness of discs and retinae with overfilling of veins and arteries in both eyes but more marked in the right one. He advised operative interference to preserve the integrity of the right eye.

The blood count was normal, with 5,520 leucocytes. The urine showed a trace of albumin and a few epithelial casts. The temperature and pulse were normal.

December 14th, 1912, eight days after admission, an external operation was performed. The front wall containing the fistula was removed, and the sinus was found filled with pus, the pulsation of which suggested a communication with the brain. The posterior wall was necrosed over an area of about 1 cm. in diameter through which the inflamed dura could be seen and pulsation could be felt. At this point the operation had to

be discontinued because the patient was doing badly, and after inserting a gauze drain, he was returned to bed. He seemed to be in fairly good condition the following day, with normal pulse and temperature. The urine, however, showed casts and albumin.

On the third day after operation, the patient became irrational and had one general convulsion which the neurologist attributed to uraemia. His examination showed increased knee jerks, clonus on left, readily exhausted on right. No Babinsky. Marked subsultus of tendon in both arms. Apparently no palsy of arms or legs which he moved voluntarily. Left pupil responded to light—right eye bandaged. Blood pressure, systolic 210, diastolic 80. The patient died during the night of the 17th, apparently from uremia.

The autopsy showed bilateral chronic suppuration of the frontal, ethmoidal and sphenoidal sinuses and of the right antrum of Highmore and chronic suppurative meningitis with secondary atrophy of the cortical substance of the frontal lobes of the brain, estimated to be of six months' duration. Infection probably pneumococcic. Gram positive diplococci.

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LXVIII.

THE TREATMENT OF NASAL ACCESSORY SINUS DISEASE IN INFANTS AND YOUNG CHILDREN.*

By L. W. Dean, M. D.,

Iowa City.

A very essential thing in treating chronic nasal sinus disease in infants and very young children is to have the patients in the hospital or better in a convalescent home adjacent to the hospital. Our convalescent home is arranged for the care of ambulatory cases and the patients in it are not subjected to the rigid rules so necessary in the hospital proper. In the convalescent home the patient is under excellent supervision and the treatment may be given just as efficiently as in the hospital and at the same time the child has every opportunity for play indoors and outdoors, a condition very essential for the proper handling of the more resistant chronic cases. Many of these cases will not become entirely well until a proper fresh air program is instituted. This latter condition might be best secured by keeping the patient at home. I feel, however, that I can only satisfactorily diagnose and treat a child five years of age or younger by hospitalizing it. In the hospital the very best opportunity for examination is given. These patients strenuously rebel at all efforts to examine and treat them. Practically all of our cases are extramural; the patients remain in the hospital and the parents go home. This gives the very best opportunity for study and treatment of the case. The giving of treatments in the absence of solicitous friends or parents is very important.

The treatment of the acute infections of the nasal sinuses in children is usually very simple. The administration of a laxative with rest in bed combined with a proper diet usually is sufficient. An exception is found in cases complicating the infectious diseases. In this instance the acute sinusitis may

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resist all treatment and extensive chronic disease of the neighboring bone result.

The treatment of the chronic infections of the nasal sinuses is a different story. While most of these cases yield readily to treatment, many especially the streptococcic infections seem as resistant to remedial and operative procedures as in the adult.

In every case of chronic nasal sinusitis, diseased tonsils and adenoids if present must be removed. In one eighteen months old baby with a posterior cleft after the removal of adenoids the most persistent treatment for two months would not obliterate a hemolytic streptococcic sinus disease. The tonsils were diseased. It was considered unadvisable to remove these before closing the posterior cleft because of the contraction of the pillars of the fauces. As the cleft could not be closed until the sinus disease was cured the tonsils were finally removed. Following their removal the nasal sinus disease rapidly disappeared and the posterior cleft was readily closed.

Eighty per cent of our chronic cases of nasal sinus disease in infants and young children have been cured by the removal of tonsils and adenoids without any other treatment. These favorable results I feel are due in great part to first, the age of the patient excluding long chronicity, and second, the comparative infrequency of nasal obstructive lesions in this class of cases. While nasal obstructive lesions in infancy and early childhood are not common, they, sometimes, are present and are important etiological factors in the production of the sinus disease. In such instances this condition must be corrected.

A warm dry climate has a decided beneficial influence on this condition. We have had one case of hemolytic streptococcic infection that did not yield to treatment until summer. Frequently those who become apparently cured by seeking a proper climate have a recurrence of the trouble on their return to our changeable and rigorous Iowa climate.

Vaccine therapy is often of great benefit. We have used only the autogenous vaccines. In many cases this has been the essential treatment. Our vaccines have been particularly unsatisfactory in the hemolytic streptococcic infections.

Nasal irrigations are used for cleansing purposes. We have used only normal salt solutions. The baby or young child is

placed on the side or on the abdomen with the head lower than the body. A fountain syringe is used. The container is not elevated more than eighteen inches above the head. The nose is thoroughly douched. We feel that this is indicated in all casas with much nasal discharge. It is a routine postoperative procedure in all of our posterior cleft and nasal sinus operations.

Coffin's method of treatment using alternately negative pressure and compression has proven to be an excellent adjunct in children that can be controlled. Following Dr. Coffin's recommendation we use with the compression some silver preparation as Silv-Albolene (1-1000). This method is very beneficial in infants that cry, and can be used without much inconvenience.

The Haskins treatment that is applying suction within the nose by means of a rubber catheter is a very valuable procedure. In my judgment the very best local treatment for sinus disease in posterior cleft cases is as follows: With the infant's mouth open cleanse every crevice of the nose with the Haskins catheter. Then brush the meati and turbinates with a ten per cent solution of argyrol or some similar drug. We do this with all of our posterior cleft cases until the nose is clean and remains so. Our percentage of good results following posterior cleft operations has been very much increased by this procedure.

In infants without clefts our favorite treatment is irrigation of the nose followed by cleansing of the nasal chambers with the Haskins catheter introduced through the anterior nares. In children too young to raise the palate and too old to cry this method is of value.

The use of dichloramin-T, two per cent, in chlorcosane after irrigation and drying the nose as suggested by Emil Mayer has been found to be of service. The dichloramin-T does not irritate the most sensitive nose.

When the upper posterior sinuses are diseased the use of three-tenths of one per cent of phenol in petrolatum as suggested by Sluder is often of great benefit. Using a metal syringe with a long flexible cannula this solution should be forced into the superior meatus. In infants a very severe

dermatitis of the lip may be caused by this solution. With the cessation of the treatment this rapidly disappears.

When a chronic Highmorian empyema has resisted treatment filling the antrum with ten per cent argyrol introduced with a trochar may result in a cure.

In the more resistant empyemas of the Highmorian antrum ventilation and drainage may be indicated. This can usually but not always be secured without loss of any turbinate tissue. Using a blunt pair of forceps the inferior turbinate is rotated in and up, then with a very small rasp an opening can be made into the Highmorian antrum through the inferior meatus. The inferior turbinate is rotated back to its normal position. Through this opening the antrum may be irrigated with silver nitrate or other solution. This may be done without great difficulty in infants. In puncturing the Highmorian Antrum in infants it is most important to have an X-Ray plate of the sinuses constantly before the operator in order that he may have the cavity exactly located. Extensive operative procedures on the sinuses in infants and young children are but rarely indicated. In those very rare cases where there are ocular or orbital complications: those with extensive bone involvement; those where the sinus infection is causing a severe systemic condition as for instance acute infectious arthritis and the sinus disease persists in spite of thorough treatment with drainage and ventilation of the sinuses; and when it can be demonstrated that an organism capable of causing the systemic condition is present in the sinuses, then extensive operations are justified.

Nasal sinus disease complicating atrophic rhinitis and syphilis we have not found to be much improved by the removal of diseased tonsils and adenoids. The treatment of the sinus disease in these two classes of cases together with the proper local and systemic measures we have found to give very fair results. Especially have we been pleased with the results in the cases of congenital syphilis.

When sinus disease has been apparently cured the cure may be more apparent than real. The nasal disease may disappear and with it the subjective symptoms. Irrigation and culture of the cavities show that they are not healed.

LXIX.

FORTY FOREIGN BODIES IN THE LUNGS, ESOPHAGUS AND INTESTINES.*

By E. W. Carpenter, M. D.,

Greenville, S. C.

This study is presented, first, in the hope that it will impress its readers with their large responsibility in recognizing these cases and the necessity of promptly investigating them; and secondly, to call to their attention the fact that this report is confined to cases in the boundaries of South Carolina.

If one man working quietly in a small community has seen this number of foreign body cases from so limited an area, then there must be a large number of unrecognized cases in our midst. The technic of investigation is difficult and must be learned on the living subject. Much can be done by practice on the human cadaver and the dog, but the problems involved present great divergence when applied to an animated subject.

The mortality in the study and removal of foreign bodies should be very low. The average case incurs absolutely no danger to life if conducted with reasonable care. The end results of the vast majority of cases of foreign bodies when not removed is death, either from mechanical obstruction, erosion into vital structures, direct or indirect infection.

In my experience three foreign bodies have been coughed up, Cases 1, 5, and 36. In the first case this occurred after the child was in a reclining position with the larnyx suspended. In the second case, while the grain of corn was expelled, a minute portion of the husk remained which caused incessant cough for nine days until it was removed. In the third case, a watermelon seed was coughed up four months after being inhaled. I believe that most of the subjects of this study

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would have died sooner or later if they had been left to their fate.

The usefulness of per oral endoscopy is not limited to the removal of foreign bodies. There are many obscure conditions which physicians meet in daily practice which could and should be brought into the light of a bronchoscope. Ulcers of the trachea and esophagus, granulations, papilloma, tumors, asthma, aneurisms, abscess cavities, strictures, malignant growths, diverticula, etc., are coming into the clear light of an intelligent diagnosis more and more.

I do not think that every doctor should possess himself of a bronchoscopic outfit, but it is essential that every one should promptly recognize these cases.

SYMPTOMS OF FOREIGN BODIES.

In most cases there is a history of a definite choking spell, varying in intensity from a transient cough or a constant hack to violent attacks of dyspnea. Jackson has truly said that cough was the watch dog of the lungs, but occasionally we find a case which is said not to have coughed after the passing of the first paroxysm. I have noticed in many cases a wheezing which did not bear a definite relation to the size or location of the foreign body.

The nature and size of the foreign body will determine the presence or absence of physical signs in the chest. If the patient is seen early after an irritating substance, like a peanut kernel, has been inhaled, moist rales are heard in the neighborhood of the foreign body. If a longer time has elapsed, both sides of the chest may be filled with moisture. If the offending substance is large enough completely to obstruct a bronchus, then breath sounds are absent in the part of the lung supplied by that bronchus. Sometimes a foreign body may act like a ball valve, permitting air to accumulate distal to it until the cut-off part of the lung becomes tympanitic (see case 14).

After an expert physical study of a chest has been made one is often without definite indications of a foreign body. The study of a case is never complete without an X-ray plate. Often all the above means fail and one has to resort to the

scope without having any definite information as to the nature of the foreign body or its location.

ANESTHESIA.

Any child or adult who can be controlled and kept from over-violent resistance should never have a general anesthetic; neither should any patient who has a dyspnea. When a general anesthetic is administered the voluntary muscles of respiration are put out of action, and it is through these muscles that the patient is kept alive in the presence of severe dyspnea.

The most difficult ages to handle are from 6 to 15 years. Often they sulk or are overcome with fright and can not be controlled. Under these circumstances as much chloroform should be used as is necessary to keep the patient quiet. Never push an anesthetic under any circumstance to the stage where the cough reflex is abolished.

In very young infants and children I do not use any anesthetic, not even cocain, unless it be to apply a minute quantity to the depths of the lungs to overcome cough under certain circumstances. In adults 10 per cent solution of cocain is usually sufficient when applied in the larnyx two or three times.

POST-OPERATIVE DYSPNEA.

In this study five cases had to be intubated because of postoperative dyspnea. The reason for this is twofold: (1) Inflammatory infiltration and (2) injury from over large tube, or trauma inflicted by a struggling subject. The obstructing lesion is usually located high up in the trachea.

The more experience one has the smaller the caliber of the bronchoscope he can work through. The larger my experience grows the less I am inclined to open the trachea for the removal of foreign bodies or for the relief of dyspnea. I believe that intubation is a better procedure for the relief of subglottic edema than tracheotomy, when the lesion does not extend beyond the reach of the intubation tube.

REMARKS.

Case 3.—Esophageal speculum revealed pin open and point up. Patient sent to hospital for removal. Three hours afterwards X-ray revealed pin in stomach.

Case 5.—A grain of corn was expelled by coughing 24 hours after inhaling it, but cough, which was constant day and night, continued for eight days. Morphin at night gave but little relief. Thinking to find a fragment of the grain of corn, the patient was scoped, and a small fragment of husk was removed from the secondary left bronchus. Patient did not cough again after leaving the table.

Case 6.—Edema, probably traumatic.

Case 8.—Edema, and bronchitis probably from septic pin, as it had been repeatedly used in a lady's veil and had probably been held in the mouth repeatedly.

Case 13.—Pin was first exposed with long narrow speculum, baby collapsed, respiration and heart stopped and my assistant counseled desistance. I discovered that the speculum had caused the trachea to collapse, thus shutting off respiration. This had never occurred to me before, and I was not on the lookout for it. A small tube exposed the pin after the child reacted, but it slid merrily down into the stomach.

Case 14.—The extreme tympany in this chest and the swollen mucosa around the grain of corn led me to think that the corn had acted like a ball valve, admitting air and imprisoning it.

Case 15.—Edema in this case was probably due to the intensely irritating quality of the peanut oil, or, as Jackson has called it, arachitic bronchitis.

Case 17.—Some authorities do not believe that the heart or respiration is stopped by stretching of the subglottic area, but in this case respiration stopped after passing a tightly fitting tube through this space and was resumed on withdrawing the scope. Through a tracheal incision the foreign body was readily removed and was accompanied by a flood of pus which threatened drowning. This was the first instance where I had opened the trachea for removal of a foreign body, and I should have been content to have left the case alone at this stage. Thinking to encourage healing of the tracheal wound, I decided to slip in an O'Dwyer tube. The edema was considerable and the tube tight fitting. As soon as the tube was seated the heart ceased to beat and could not be aroused. In a few cases since this I have been content to trust to the tracheal wound for

breathing and leave it absolutely alone except to keep it scrupulously clean.

Case 20 was one of threatened drowning. I believe the future holds a field of usefulness for the bronchoscope in similar conditions.

Case 23.—Similar to case 17 in respect to cessation of respiration on introduction of scope. After respiration was reestablished I could not persuade a 5 mm. scope to reenter the trachea. Trachea incised, but the trachitis was so intense that a 5 mm. tube would not enter. This was previous to the manufacture of a 4 mm. scope. Another physician attempted to introduce the tube through the high and low route with similar results.

SUMMARY.

Vegetable substance	23
Animal	3
Mineral	13
Not identified	1
Deaths (Cases 17, 19 and 23)	3

TABLE OF CASES.

Name	Age	Object	Location	Time in Situ	Type of Oper.	Result	Complication and Remarks
1. E. S.	8 yrs	Clove	Trachea	3 hrs	High	Cure	The epiglottis was elevated; violent cough expelled clove.
2. J. L.	1 yr	Grain of corn	R. B.	10 hrs	High	Cure	Corn fragile and broke frequently in attempt to extract it.
3. A. B.	18 yrs	Safety pin, open	Esophagus	7 days	High	Recovery	Pin exposed in esophagus; patient transferred to hospital. Dislodged after x-ray and passed into stomach. Recovered in stools 6 days after.
4. R. H.	18 mos	Nut kernel	L. B.	30 hrs	High	Cure	Walnut.
5. W.W.W.	30 yrs	Corn husk	L. Sec. B.	9 days	High	Cure	Grain of corn coughed out in 24 hours. Cough continued and a piece of husk 1½ to 2 mm. removed. The cough ceased promptly.
6. T. J. E.	5 yrs	Watermelon seed	R. B.	3 days	High	Cure	Violently resisted; subglottic edema. Intubated.
7. J. P.	6 yrs	Corn	L. B.	5 hrs	High	Cure	
8. W.	2½ yrs	Straight pin, 1¼ in.	L. B.	24 hrs	High	Cure	Subglottic edema and bronchitis. Intubated.
9. E. B.	7 yrs	Nail, 2 in.	R. B.	30 hrs	High	Cure	
10. P. R.	3 yrs	Lead ball	L. B.	5 days	High	Cure	Large circumference and difficult to grasp.
11. M. L.	20 yrs	Straight pin	Buodenum	3 days	None	Recovery	Located with x-ray. Expelled in 6 days. Complained of pain on swallowing.
12. J. P.	6 yrs	Grain of corn	L. B.	6 hrs	High	Cure	
13. H. P.	7 mos	Safety pin, open, point up	Esophagus	14 hrs	Pushed into stomach. Gastrotomy	Cure	Examination with esophageal speculum caused great shock. Small tube substituted. Trachea collapsed with small speculum in esophagus.

Name	Age	Object	Location	Time in Situ	Type of Oper.	Result	Complication and Remarks
14. R. D.	4 yrs	Grain of corn	L. B.	8 hrs	High	Cure	Subglottic stenosis for 48 hours of moderate severity. Left chest very tympanitic.
15. F. F.	2 yrs	Peanut kernel	L. B.	3 days	High	Cure	Small larynx, tight tube. Intubated. Severe bronchitis. Extubated in 48 hours.
16. H. N.	1 yr	Green string bean	R. B.	6 hrs	Low	Cure	Tube could not enter main bronchus. Bean about 1 inch beyond end of scope was grasped with forceps.
17. T.	19 mos	Grain of corn	R. B.	2 weeks	High and low	Death	Lung filled with pus. Scope passed through subglottic area with difficulty because of infiltration. Respiration immediately suspended. Low operation: grain of corn easily extracted; flood of pus deluged field. Respiration re-established. Intubation tube introduced; tight fitting; heart immediately stopped. I should have left tracheal wound open and not used the O'Dwyer tube.
18. W. M.	17 mos	Corn bread crumbs	Diffused through bronchi	2 hrs	High	Cure	Respiration very shallow before operation and patient limp; no breath sounds over chest. Quantity of thick, ropy mucus with crumbs of corn bread removed. Free respiration with noisy crying established.
19. A. G.	3½ yrs	Lima bean	Orifice R. B.	48 hrs	High	Death	Skin of bean peeled off easily; bean was softened. Broke away in trachea. Cyanosis and death instantly.
20. M.	5½ yrs	Said to be coffee bean by another physician	R. lung	10 days	High	Cure	Cyanosis and impending death on admission. This was a second-handed case. I removed quantities of mucopus; re-established easy respiration. Pneumonia present. Did not find a foreign body.

Name	Age	Object	Location	Time in Situ	Type of Oper.	Result	Complication and Remarks
21. F. H.	5 yrs	Lead bullet	L. B.	2 weeks	High	Cure	Bullet 32½ mm. circumference difficult to hold in grasp of forceps.
22. H.	2 yrs	Open safety pin, point up	Larynx	2 hrs	High	Cure	Point of pin up; hood just under vocal cords; grasped and wriggled through cords.
23. H.	13 mos	Not known		6 weeks	High and low	Death	No investigation permitted until six weeks after choking spell because only symptom was an occasional hacking cough; tracheal mucosa greatly swollen and tube fitted tightly; respiration ceased when it was introduced. Trachea opened, but tube could not be introduced. Quantities of pus present.
24. N. R.	12 yrs	50-cent piece	Esophagus	3 days	High	Cure	Remarkable tolerance of larynx.
25. J. H.	13 yrs	Cockle burr	Larynx	3 days	High	Cure	Ulcer of abdominal esophagus. Ulcer gave no previous indication of its presence; no subsequent trouble.
26. J. M.	55 yrs	Fresh pork	Pyloric end esophagus	24 hrs	High	Cure	
27. V. R. J.	46 yrs	90 grains beef	Esophagus 4th dorsal	30 hrs	High	Cure	Two previous choking spells. Dilated esophagus above obstruction. Lumen of esophagus narrow and rigid for about 1½ in. 4 yrs. after patient is well.
28. B. R.	6 yrs	Fragment ripe peach	Orifice R. E. B.	48 hrs	High	Cure	Delivered through scope with sucking noise; fitted like a piston.
29. D.	4 yrs	Tin whistle	Esophagus sternal notch	4 days	High	Cure	A previous attempt had been made in another city to remove the whistle with a Killian instrument which overrode it and persistently hid it from view. A Jackson speculum exposed it.
30. E. T.	58 yrs	Gold tooth plate	Esophagus above sternal notch	2 hrs	High	Cure	38 by 21 mm. with three sharp hooks.

Name	Age	Object	Location	Time in Situ	Type of Oper.	Result	Complication and Remarks
31. O. L. P.	40 yrs	Beef	Esophagus 9 in. below teeth	3 days	High	Cure	Ulcer at site of obstruction. Emaciated, chronic indigestion before incident. Ulcer treated and healed. General health greatly improved.
32. J.	18 mos	Fragment peanut shell	Trachea	4 hrs	High	Cure	Hand suspension with Jackson speculum. Forceps passed through cords for about 2 in. Shell grasped and extracted without a tube.
33. M. L.	14 mos	Raw peanut kernel	R. B.	3 days	Low	Cure	Intubated 15 hours after bronchoscopy. Raw peanut kernel being very brittle, I feared attempting to pull it through cord and opened trachea; tracheal wound approximated and I decided to intubate when stenosis developed. Intubated 4 times in 2 weeks. Tracheal wound healed by first intention.
34. F. W.	16 yrs	Straight pin	Esophagus behind cricoid	24 hrs	High	Cure	Head down against anterior wall; point imbedded in post wall.
35. D. M.	11 mos	Pine tree bark	Trachea 1½ in. below cord	48 hrs	High	Cure	Hand suspension; extraction without tube.
36. R. S.	3 yrs	Watermelon seed	Lung	4 mos		Recovery	Instrumentation not permitted. Patient coughed out seed 4 mos. after.
37. C. S.	21 yrs	Half peanut shell	R. B.	2 weeks	High	Cure	This shell was rolled into a small rod and was very soft and difficult to dislodge.
38. D.	3 yrs	Safety pin, point up	Larynx	3 weeks	High	Cure	Hood end between vocal cords. First attempt to remove followed by hemorrhage, child vigorously resisting. Under light chloroform anesthesia point thrust through one cord when a fresh hold permitted turning and extraction.
39. J. P.	6 yrs	Watermelon seed	L. B.	5 hrs	High	Cure	
40. C. Y.	3 yrs	Grain of corn	Trachea	3 days	High	Cure	

LXX.

DRUM TENSION AND MIDDLE EAR AIR PRESSURES; THEIR DETERMINATION, SIGNIFICANCE AND EFFECT UPON THE HEARING.

By Edmund Prince Fowler, M. D.,

New York City.

Experimenting with glass models of middle ears, and drum membranes of various strengths, elasticities and tensions, I have demonstrated that plus or minus air pressures therein may be very accurately determined by the use of aneroid barometers connected with the distal side of the drum. Moreover, I have shown that experimental air pressures in the human middle ear may be approximately measured by methods worked out with the models.

One of the simpler procedures is the following:

After the usual inspection I employ a magnifying pneumatic speculum having from its tube leading to the examiner's mouth an offset connected to an aneroid monometer (the ordinary sphygmomonometer serves well).

The examiner, focusing his eye particularly upon the posterior superior quadrant of the drum (this being usually the most movable), very gently alternately compresses and rarefies the meatal air by blowing and sucking through the mouth tube, gradually increasing these efforts until he is just able to detect a movement of the drum. The amount of plus or minus pressure required to make this movement visible, being approximately equal to the pressure behind the drum, is noted as registered upon the dial of the aneroid. (Plus pressures vary up to one and one-half times the pressure we are measuring in the middle ear.) With practice the manometer may be dispensed with for qualitative work, as one soon learns to interpret, with sufficient accuracy for clinical purposes, the amount of effort required to produce up to 1 or 2 mms. pressure (plus or minus). Pinching and releasing the open mouth tube between the teeth creates 1 to 2 mm. plus and minus pressure, etc.

Unless adhesions leave no portion of the drum membrane movable, the method given you will detect pressure variations satisfactorily. Forcible efforts may locate adhesions but are misleading when used for determining pressures. To avoid false impressions, especially with relaxed drums or centered drums, it is important to employ both suction and compression through the speculum.

I call a drum centered when it is in the plane of its peripheral attachment, as modified by the malleus or adhesions—i. e., the air pressures are equal upon its two sides.

Although a report in detail cannot be submitted until a later day, at this time it is proper to note a few of the results obtained through the use of the method, these having a direct bearing upon the subject under discussion:

1. Negative pressures have ranged from nil to 20 mm. Hg. (never more than 20 mm. negative pressure).

2. Positive pressures have been largely experimental; 250 mm. are borne per tubam by many persons without pain or apparent damage to the ear. After politzerization from nil to over 20 mm. Hg. have been measured. By Valsalva's method the greatest pressure I can maintain is about 100 mm. Hg. Politzer states that the drum will withstand from 3 to 4 atmospheres without rupture (45 to 60 pounds to the square inch area of drum).

3. In a large proportion of the cases examined, no abnormal pressures were demonstrable, although from the usual interpretation of the otoscopic and inflation findings ample evidence of such presented.

4. Contrariwise, in tubes showing patency to even gentle inflations, I have observed vacuums in the middle ear of from 10 to 15 mm. Hg. This demonstrates the inaccuracy of our present methods for diagnosing tubal closures, and again calls attention to the valvelike action from slight negative pressures in the middle ear, and the necessity of restoring tubal function rather than tubal penetrability to inflation.[1]

5. Exceptionally I have examined tubes apparently impervious to air by all the usual methods of inflation, and yet there were vacuæ in these middle ears. The significance of these findings appears to be:

1. Negative pressures have not exceeded 20 mm. Hg., because at about this figure there will occur an obliteration of the tympanic cavity by serum transudate or sucking together of the walls. In experimental pressures the collapse of the tubal walls prevents further vacuæ than 20 mm.

2. That almost unbelievable amounts of plus pressures are bearable without pain is corroborated by clinical experience with acute abscesses, such often giving no distress, though the exudate pressure is high. (Bulging of the drum is not the cause of pain per se.)

3. The otoscopic picture heretofore accepted as meaning middle ear vacuum is in reality often a sign of past pressures, the malleus and drum remaining in the retracted position from tensor tympani shortening, adhesive processes or simple redundancies.

4. Especially because of the habit of forcibly sniffing air through the nose or violent attempts at clearing the nasopharynx of mucus, a negative pressure is easily established within the middle ear, due to the collapse of the tubal walls and subsequent air absorption increasing this closure. A slight tugescence or narrowing of the tube from any cause will in such cases interfere with the physiologic reestablishment of the normal air balance. Even gentle inflations may, however, suffice to reventilate these ears, unless continued repetition finally diminishes the resiliency of the tubes.

5. Except to remark that we have much to learn, I will at this time attempt no comments upon the seeming paradox of stenosed tubes and no accompanying middle ear vacuums.

The effect upon the hearing of middle ear air pressures is shown in the following tables.

I grant that the experiments are complicated by the unavoidable effects upon the inner ear, through pressures upon the peri and endolymph, but it appears reasonable to infer that either equal plus or negative pressures upon the drum, ossicles, oval and round windows, and labyrinth contents, must about equally immobilize the same, and thus equally increase bone conduction and offset to this extent the loss in hearing brought about by labyrinth end organ inhibition. Also as the tubes are wide open during Valsalva's method of inflation, the sound of vertex forks will be augmented, as I have elsewhere

shown.[2] The effect upon the oval window of autodeflation is lessened by the opposed actions of the drum and the vacuum created in the middle ear.

These facts are brought forward to support the claim that the experiments show, it may be only roughly, the loss of hearing caused by drum hypertension. Condensation and rarefaction of meatal air bring out more forcibly the effects upon the endolymph, by stapes and round window movement, and for that reason were not employed in these tests.

To simplify the data I have reduced all results to percentages of reduction or of duration of sound.

A positive air pressure of 20 mm. Hg. within the middle ear, instituted and maintained by the Politzer bag or by Valsalva's method of inflation, diminishes the perception of tuning forks on an average as follows:

	C	Dur.	C1	Dur.	C2	Dur.	C3	Dur.	C4	Dur.
A. C.....	50%	25/50	43%	17/30	33⅓%	40/60	27%	22/30	5%	19/20
B. C.....	4%	24/25	14%	13/15	16 %	28/33	20%	12/15	10%	9/10

A negative air pressure, estimated to be 20 mm. Hg., was attempted, as this was the highest negative pressure observed in disease, and the highest I could maintain in my own ears. Seeming irregularities in the data are probably due to my inability to hold the pressure with certainty. The perception was diminished as follows:

	C	Dur.	C1	Dur.	C2	Dur.	C3	Dur.	C4	Dur.
A. C.....	46%	27/50	36%	19/30	33⅓%	40/60	17%	25/30	5%	19/20
B. C.....	8%	23/25	15%	13/15	18 %	27/33	20%	12/15	10%	9/10

Note that 20 mm. Hg. pressure lowers the hearing time to about the same degree, irrespective of whether it is plus or minus: a trifle less for the two lower forks by A. C. with plus pressures, a trifle more for the three lower forks by B. C. with minus pressures.

To eliminate largely the factor of bone conduction fluctuations, both ears were closed by perforated plugs. This increases the normal B. C. from 5 seconds for C^2 down to nil for C^4, as shown in the tables. Twenty mm. plus pressure by Valsalva shows duration of hearing is diminished:

Twenty mm. plus pressure by double autoinflation through the nose and meatal plugs as follows:

C	Dur.	C1	Dur.	C2	Dur.	C3	Dur.	C4	Dur.
20.0%	24/30	42.4%	10/17½	34.2%	23/38	25.0%	12/16	00.0%	10/10
6.6%	28/30	31.4%	12/17½	23.8%	29/38	12.5%	14/16	0.0%	10/10
Difference—									
13.4%	4/30	11.0%	2/17½	10.4%	4/38	12.5%	2/16	00.0%	0.00

The percentage of difference represents, roughly, the effect of drum tension upon craniotympanic conduction, as in the first experiment the drum was markedly tensified, and in the second drum movement was avoided by the positive pressures being made equal upon its two sides. Otherwise the experiments were identical.

Drum tension then gave us a reduction in hearing of, say, 10½ to 13½ per cent, except for the highest fork, for which no change between the two conditions could be sensed. As this fork shows little or no effect from pressures of any sort, such a result was to be expected.

The differences between the data last obtained, from the data in the first table, may be in part accounted for by the elevation of the standards for bone conduction. This removes two factors which in the first table were operating, namely:

1st. The increase in bone conduction time when pressure loads the middle ear mechanism.

2. The lower standard which in itself prevents a proportionately equal fall in hearing.

In bone conduction experiments, one cannot obliterate all air conduction (craniotympanic), and this difficulty mounts higher with the higher forks. I have, however, eliminated to a great extent the differences in bone conduction, and when this was done it appeared as though but little loss of hearing occurred by tensification of the drum, but that the more important inhibitors of audition were the obstructions to sound transmitted, set up by the tensification and loading of the whole apparatus, and the inhibition to sound perception by pressure changes upon the endolymph and labyrinthine end organs.

Rinné was never negative, in spite of the concomitant limitation by immobilization of the vibratility of the whole conducting mechanism. I have been unable to create a negative Rinné by the ordinary plus or minus pressures within the middle ear. These observations lead me to believe that drum hypertension cannot cause it. Though hearing be markedly

lessened by obstructive processes, inflations per tubam may increase audition, with the drum hypotense or not, thus again indicating that more important than drum tension is mobilization of the conducting mechanism. This is suggested also by the fact that many people with relaxed, weak or retracted drums hear exceptionally well (a whisper at more than twenty feet).

A study of the tables will suggest many fascinating lines of thought, but before even suggesting any such, I must very carefully and repeatedly check up the data, for it is more difficult than it appears at first thought to put down results in figures which one may state are final.

CONCLUSIONS.

1. Middle ear air pressures and resultant drum tensions may be accurately diagnosed and estimated by the method I have described.

2. Almost unbelievable amounts of positive pressure are borne without pain.

3. Inspection and inflations are often misleading as to the present state of the air pressure in the middle ear.

4. The position of the drum and attachments alone cannot inform us of the presence of negative air pressure behind them or of the amount of tension loss. The otoscopic picture heretofore accepted as meaning middle ear vacuum is in reality more a sign of past negative pressures.

5. The eustachian tube need not be demonstrably patent to inflations in order to maintain an approximately normal air balance within the tympanic cavity.

6. Slightly blocked tubes may cause marked vacuums and yet be easily inflatable. The primary requisite for all cases of abnormal drum tension is the maintenance of tubal function.

7. The experiments detailed show the effects of drum tension upon craniotympanic conduction.

8. A negative Rinné indicates more than hypertension of the drum.

9. The relative importance of drum tension per se has been overestimated. Of equal or more importance is the vibratility of the conducting mechanism of the middle ear.

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2. Fowler, E. P.: Physiology of the Eustachian Tube. J. Am. M. Ass., July 31, 1909.
Fowler, E. P.: Diagnosis of Ossicular Ankyloses. Laryngoscope, April, 1909.

616 MADISON AVE., June 1, 1920.

LXXI.

THE MORTALITY FROM MASTOIDITIS IN THE U. S. A. BASE HOSPITAL AT CAMP PIKE, ARK.

By R. P. Stoops, M. D.,

formerly capt. m. c., u. s. a. base hospital,

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During the past year several articles have appeared in the medical literature concerning the many cases of mastoiditis seen in the various army hospitals in the United States. There has been frequent comment also, and sometimes adverse comment, regarding the large number of mastoidectomies performed in the army hospitals situated in the southern part of the United States.

The Base Hospital at Camp Pike, Ark., was opened for the reception of patients on September 27, 1917, and closed about July 1, 1919. During this period 269 patients were operated upon for mastoiditis out of a total of 55,532 admissions into the hospital, the proportion being, therefore, one mastoid patient out of about 205 admissions. This is admittedly a large number of mastoid operations, a fact which was fully appreciated by the personnel of the otolaryngologic service and by the various medical officers who acted as chiefs of the surgical service. Many methods of treatment were followed, but the mortality remained almost constantly the same. One otologist of splendid training and adequate experience became pessimistic as to the benefits of the mastoid operation and attempted to treat practically all the cases of streptococcic otitis by free paracentesis and the application of various medicaments to the external auditory canal. Some patients on whom the diagnosis of mastoiditis was certain apparently recovered and were discharged from the hospital, but so far as the writer is aware all these patients suffered a recurrence of the disease and were operated upon later. However, the most noticeable result of this conservative method of treatment was an imme-

diate and alarming increase in the cases of lateral sinus thrombosis, five cases developing this complication within a few weeks.

After the various departments of the Base Hospital became thoroughly organized it was a practice to request an autopsy upon every patient dying in the otolaryngologic wards. At these autopsies, especially during the last year of the hospital's operation, the pathologist in every case endeavored to find the nature of the complication causing death and the point at which the infection reached the meninges. It is believed, therefore, that a detailed study of these cases will be of special interest, particularly as so many patients, seven at least, lost their lives from osteomyelitis of the apex of the pars petrosa, a complication which develops independently of the disease in the mastoid process and which is beyond the scope of mastoid surgery.

Out of the 269 cases operated upon there were 28 deaths from all causes, giving a mortality rate of 10.4 per cent. In cases operated upon one side, the percentage was 9.1, while patients with bilateral mastoiditis, of which there were 28, showed a mortality of 21.4 per cent.

It was the impression of the otolaryngologic personnel that the infections of the mastoid process increased in severity as time went on and the infecting organisms increased in virulence. This opinion is not borne out in the statistics, as the death rate was about 10 per cent for the entire period, with eleven deaths among the first one hundred patients operated upon and seven out of the last sixty-nine. It is possible and indeed probable that improvement in methods of operation may have lowered what would otherwise have been a much higher mortality during the last year of the operation of the Base Hospital, but this must be left to conjecture.

Etiology.—In by far the great majority of cases the streptococcus hemolyticus was found to be the causative organism. Eight of the fatal cases were admitted with a primary otitis media, eight for measles, three for tonsillitis, three for coryza, two for influenza, two for bronchitis, one for lobar pneumonia and one for mumps (?).

The epidemic of influenza played little part in the incidence of infections of the middle ear. Most of the patients suffer-

ing from this disease were admitted between July 15th and October 15th. During this period there were 17,679 admissions into the hospital, only nine of which were operated upon for mastoiditis. The mortality, however, was high, five of these patients succumbing to the infection. This high death rate was due probably to a succession of extremely unfavorable cases. All were operated upon by surgeons of extensive experience, and among them were included two patients with brain abscess, one with sinus thrombosis and one with an infection of the petrous process.

Sex.—Only two females were operated upon for mastoiditis out of a total of 474 nurses who were on duty at the Base Hospital up to April 1, 1919. One of these died from an infection of the petrous portion after an apparent recovery from a cerebral abscess of the right side.

Race.—All the fatalities were among the white patients. Eleven negroes were operated upon but none died.

Length of Service.—This varied from two weeks to eleven months. On an average the patients were admitted from the second to the fourth month of army service.

Time of Operation.—The time intervening between the onset of otitis media and the mastoid operation varied from three to thirty-five days. These figures are fairly representative for all the cases operated upon, and the writer does not believe that the results obtained at Camp Pike indicate the advisability of the extremely early operative interference as a routine practice.

Time of Death.—Necrosis of the squamous bone into the middle fossa caused death in from eight days to eleven weeks; erosions into the posterior fossa were fatal from the fifth to the ninth week; lateral sinus thrombosis with meningitis caused death in from five to nine weeks; one case dying of pyemic abscess and empyema after complete closure of the mastoid wound did not succumb until the seventeenth week. Necrosis of the tegmen tympani resulted in death twelve days after the diagnosis of otitis media and twenty days after the onset of measles. Infection of the pars petrosa was fatal in from six to thirty-five weeks.

LESIONS CAUSING DEATH.

Lobar Pneumonia.—Two patients died from this complication, one death occurring three days and the other six weeks after operation.

Intracranial complications were the cause of twenty-six fatalities, all of which were due to a terminal meningitis except the one patient mentioned above, who succumbed to empyema and pyemic abscess after many weeks of illness. The practical application of these facts would seem to be that after the operation for streptococcic mastoiditis the death of a patient without pyemic symptoms and with normal cerebrospinal fluid must be ascribed to another cause than an intracranial complication. In the following table the fatal cases are arranged in groups according to the paths by which infection reached the meninges from the middle ear, mastoid process or eustachian tube. This classification seems a better one than that usually found in works on otology because, in the first place, practically all these patients died from a meningitis; again, the cerebral abscess when found is usually a mere incident in the course of a meningitis, and finally the clinical pathology of the disease is better understood when studied in this manner. It is also worthy of note that no case of extradural abscess occurred in our wards.

In smears of pus from the middle ear, the mastoid or the cerebrospinal fluid the streptococcus is commonly found as a Gram positive diplococcus. Cultures taken from the same source show a growth of streptococcus in typical chain formation. Many of the earlier cases of mastoiditis at Camp Pike were reported as due to the pneumococcus, whereas the streptococcus was the causative organism. The writer was present at the last twelve autopsies performed, and in all the streptococcus hemolyticus was found on culture. It is also worthy of note that the streptococcus nonhemolyticus was frequently found in the middle ear and the streptococcus hemolyticus in the antrum or mastoid cells.

Case No.	Mos. of Service	Etiology	Day Opera'd	Onset Fatal Comp.	Week of Death
		Osteomyelitis of Pars Petrosa.			
		(a) Perforation Under Gasserian Ganglion.			
170	.....	Primary Otitis.....	4th	?	23rd
172	1	Influenza	8th	?	35th
174	3	Primary Otitis.....	9th	?	13th
206	4	Measles	12th	?	8th
		Perforation in Anterior Surface of Petrosa.			
15	1	Measles	26th	?	9th
209	2	Measles	15th	?	17th
257	6	Tonsillitis	14th	?	7th
		Necrosis Through Inner Table of Pars Squamosa Into Middle Fossa.			
126	5	Coryza	21st	5th wk.	7th
138	4	Primary Otitis.....	13th	2nd wk.	3rd
169	1	Measles	12th	-7th wk.	11th
191	1	Measles	3rd	1st wk.	2nd
214	4	Primary Otitis.....	24th	-4th wk.	4th
		Erosions Into Posterior Fossa.			
51	3	Tonsillitis	5th	7th wk.	9th
84	1	Lobar Pneumonia..	14th	5th wk.	7th
94	5	Primary Otitis.....	4th	5th wk.	5th
		Erosion Through Tegmen Tympani			
49	4	Measles	2nd	2nd wk.	2nd
		Lateral Sinus Thrombosis.			
179	1	Influenza	19th	3rd wk.	17th
204	4	Primary Otitis.....	15th	4th wk.	6th
246	11	Primary Otitis.....	4th	6th wk.	8th
262	9	Bronchitis	32nd	6th wk.	7th
		Leptomeningitis—Path of Infection Not Found.			
8	1	Coryza	18th	12th wk.	13th
9	6	Tonsillitis	24th	9th wk.	9th
37	2	Coryza	25th	9th wk.	10th
38	?	Bronchitis	16th	3rd wk.	4th
102	4	Primary Otitis.....	35th	7th wk.	8th
138	4	Primary Otitis.....	33rd	-5th wk.	5th
167	1	Measles	2nd	1st wk.	1st
		Lobar Pneumonia.			
6	4	Measles	2nd	7th wk.	9th
96	4	Primary Otitis.....	16th	3rd wk.	3rd

Remarks.—Among the patients dying with osteomyelitis of the petrosa, none was found to have developed brain abscess from perforation under the Gasserian ganglion. However, one patient (172) presented definite symptoms of a brain abscess with an apparent recovery from this complication. The abscess, however, was not situated at the base of the skull but was situated in the Rolandic area because there was a facial paralysis of the opposite side. In one instance (170) an attempt had been made to close the posterior wound by plastic operation without beneficial result. Case 174 was operated upon for pneumococcic mastoiditis of the right side, became infected with streptococcus in the ward and developed mastoiditis of the left side and lateral sinus thrombosis. He was operated upon for these affections, and all the wounds healed kindly, but the patient died from the infection of the petrous bone and meningitis. Case 206 was operated upon for a right mastoiditis and later refused operation on the left mastoid with fatal results.

When the perforation is in the anterior surface of the petrosa there is apt to be a brain abscess. In cases 15 and 209 both had this type of perforation and both had brain abscesses in relation to the perforations. Case 15 showed a similar perforation on the opposite side without formation of a brain abscess. In case 257 there was a sudden rupture of a large quantity of pus from the excavated petrous bone and the patient died quickly from meningitis.

Necroses through the squamous into the middle fossa resulted in brain abscess in all the five cases tabulated, with the exception of case 138, in which autopsy demonstrated the presence of hemorrhagic external pachymeningitis of some weeks' standing, with partial organization. In case 169 there was an infection of a group of zygomatic cells anterior to the auricle, with perforation and the formation of brain abscess with typical symptoms; the abscess was drained but meningitis developed immediately.

Only one case (94) of cerebellar abscess was among the three patients who died from erosions into the posterior fossa. However, the other two patients had choked discs and other signs indicative of increased intracranial pressure, and it is possible that at autopsy on these patients cerebellar abscesses

were overlooked. In case 84 the perforation was in the depth of the wound lateral to the antrum, and in case 51 the necrotic area was posterior to the lateral sinus.

Two patients died of lateral sinus thrombosis after ligation or excision of jugular and obliteration of the sinus. Case 204 died of meningitis and case 179 succumbed to empyema and septic abscess, as mentioned above, after complete healing of the operative wounds. Cases 246 and 262 had sinus thrombosis with completely occluding thrombus and developed meningitis from perforations about one inch external to the torcular Herophili, one perforation opening into the posterior fossa (246) and the other into the middle fossa (262). Case 49 developed meningitis from a perforation of the tegmen tympani.

Among the seven cases who died of meningitis and in which the path of infection was not found, the histories show that three (9, 38, 102) had symptoms pointing to lateral sinus thrombosis, such as chills, high fever and arthritis.

CONCLUSIONS.

From a study of the fatal cases of mastoiditis occurring at the Base Hospital at Camp Pike, Ark., the following conclusions seem justified.

1. The microorganism responsible for most cases of mastoiditis was the streptococcus hemolyticus.

2. Deaths due to otitic complications were attributable for the most part to osteomyelitis of the pars petrosa, erosions into the middle fossa, lateral sinus thrombosis, erosions into the posterior fossa and necrosis of the tegmen tympani, the comparative frequency of these routes of infection being in the order named.

3. The streptococcus hemolyticus attacked by preference the cancellous tissue of the bony structure, resulting in a true osteomyelitis and not in a mere empyema of the mastoid cells. Access to the meninges and the lateral sinus was effected by the perforation of thin plates of bone. The dense bony capsule of the labyrinth was entirely resistent to the streptococcus hemolyticus. The tegmen tympani also seeemd to enjoy an immunity, which was probably due to the performance of early and repeated paracenteses.

4. Erosions into the middle and posterior fossæ and perforations of the anterior surface of the petrosa were commonly associated with brain abscess, which was often without symptoms and a mere incident in the course of meningitis.

5. Extra dural abscesses were not associated with infection by the streptococcus hemolyticus.

6. The mortality rate for bilateral mastoiditis was more than twice that for mastoiditis of one side.

7. Infection of the pars petrosa develops independently of the disease in the mastoid process and is beyond the scope of a mastoid operation. The mortality from this single complication was approximately 2½ per cent.

ABSTRACTS FROM CURRENT LITERATURE.

I.—EAR.

Intracranial Lesions Involving the Auditory-Vestibular Apparatus.

Carpenter, E. R.

J. Am. M. Ass., Chicago, 1920—LXXIV—469-471.

Intracranial lesions involving the auditory-vestibular apparatus may be considered to advantage under three heads: (1) lesions primarily involving the cerebellar fossa; (2) lesions primarily involving the brain steam and midbrain, and (3) lesions primarily involving the cerebral cortex and subcortex region.

1. Lesions in the region of the cerebellum are of special importance to the otologist, as they include many conditions that are amenable to improvement or cure if they are diagnosed early and properly treated. The lesions most likely to be encountered here are acute inflammatory diseases involving the meninges, acute and chronic abscesses, tumors of the meninges and of the nerve trunks, syphilis in its various forms, traumatism, circulatory diseases, tuberculosis and multiple sclerosis. Eighty per cent of the abscesses in the posterior fossa originate from infected ears; consequently, the diagnosis and treatment of this condition falls primarily to the otologist, who must be familiar with the differential prognosis of lesions in this region and with the various operative procedures required for relief. In all major otologic operations, repeated vestibular tests should be made, as they often indicate intracranial trouble long before clinical symptoms develop.

2. Any of the diseases already considered may also involve the auditory-vestibular apparatus in the brain stem; but the symptomatology in brain stem lesions varies considerably from that encountered in the cerebellar region. Certain additional diseases peculiar to the nervous system are encountered in the medulla, pons and midbrain region, such as tabes, syringomyelia and polioencephalitis. However, the preponderance of brain stem lesions are included under syphilis, tuberculosis, circulatory trouble and toxemia.

3. Cortical and subcortical disturbances of the auditory-vestibular apparatus have not been investigated thoroughly. However, the tracts of the auditory fibers are well known, and the auditory centers are known to be located in the first temporal convolution on each side of the cerebrum, and lesions in that region may produce disturbance in hearing, especially if bilaterally located. No doubt some cases of deafness originate from this source which are presumed to be of labyrinth origin, as microscopic study of the pyramidal cells in the first temporal convolution reveals intercellular changes similar to those found in the motor and sensory

pyramidal cells, in certain diseases. Possibly in exceptional cases the auditory disturbance in tabes, polioencephalitis, paresis, toxemia, and especially in some of the infectious diseases, are from this source. Emil Mayer.

Anomalous Sigmoid Sinus Thrombosis With Report of Cases.

Barnhill, John F.
Med. Rec., N. Y., 1920—XCVIII—388.

Many case reports show atypical sinus thrombosis in that there is an almost complete absence of ear symptoms. The rather common belief that there must be present a discharging ear, mastoid tenderness and great pain should be revised. Especially should emphasis be given to the fact that swelling and tenderness of the neck along the course of the internal jugular vein are rarely present, and only in the late and fatal cases. In my own experience of 37 cases of sinus thrombosis, mastoid tenderness has been absent in nearly 50 per cent, and in one only, a case that was septic generally, partially unconscious and near death, was there swelling of the neck along the vein. In only five of my cases have there been actual chills. Chilly sensations have usually been present, but this fact is ascertained only by carefully watching the patient, and by frequently quizzing the attendants concerning the point. Strabismus and other eye symptoms have likewise been rare. Only 16 of my patients were examined for optic neuritis, and but two of these had choked disc, a rather low percentage, since Crockett reports that 25 per cent of his cases had choked disc, while Jansen states 28 per cent, and Johnson records two-thirds of all cases.

Occasionally a case is met with in which the aural discharge is absent, or apparently absent, and no history of former discharge can be obtained. Numerous cases of this class are reported. There is another type of case in which there either has been no discharge at all, or in which the discharge has been trivial and has continued only a few hours or days.

The cases here reported had each an acute and trivial otitis which lasted but a few hours or days, was then either forgotten or disregarded, and was later not connected with the serious illness which followed. Emil Mayer.

A Case of Cerebellar Abscess Diagnosed Postmortem.

Lobell, Abraham.
J. Am. M. Ass., Chicago, 1920—LXXV—601.

This case is a concrete example of the serious complications to which the human organism is subjected in the presence of a chronic focal infection. In this man, it was the cause of a cerebellar abscess and very likely the osteomyelitis of the foot.

Did this man walk around with a socalled latent abscess, lying dormant for many years and only aroused to mischief by an intercurrent secondary pneumococcus infection? That this is not uncommon in spite of the absence of definite symptoms, has been established by numerous observers. To explain how this takes

place it is necessary to recall the cardinal symptoms and signs of a cerebellar abscess, namely, headache, mostly occipital, persistent vomiting, dizziness, vertigo, staggering gait, etc. These are the very signs and symptoms of a labyrinthitis, a condition invariably associated with cerebellar abscess in those instances in which the infection travels by contiguity through the labyrinth from the mastoid to the cerebellum. However, in those cases in which the infection travels through the small veins from a necrotic area in the cells of the mastoid, the destruction of the cerebellar tissue is a slow and gradual process, and the labyrinth remains intact, capable of taking up the function of the cerebellum. It is for this reason that in this variety there are no signs and symptoms, and the Barany test is also negative. In addition to the labyrinth, the destruction of cerebellar tissue is also compensated by the cerebrum, the vestibular nuclei and the sensory tracts.

We may inquire into the immediate cause of the death in this case, but a true explanation is only problematic. In other reported cases of similar outcome, it was thought to have been caused by the pressure of the abscess on the medulla, as a result of an increasing edema from ether congestion of the brain. It is for this reason that some authorities advice judicious and careful administration of chloroform in preference to ether in diagnosed cases of cerebellar abscess, believing that it produces no congestion in the brain. Another important factor must be considered in the causation of immediate death, and that is the performance of a lumbar puncture while the patient was still on the operating table, about twenty minutes before he died. Although only 10 cc. of cerebrospinal fluid was withdrawn, under apparently high pressure, nevertheless it must have influenced the pressure of the abscess on the vital centers in the medulla, especially in the seat of respiration. This is in accord with the established dangers of performing lumbar punctures in cerebellar tumors or abscesses. It may be of interest to recall that the most deceptive element in the course of this man's illness was the fact that he improved and was well for a while. This interval of well being usually diverts our attention from the suspicion that we are dealing with a serious disease. This interval has occurred in many cases that are recorded, and some observers have come to look on this as a characteristic feature of the course of the disease. Emil Mayer.

II.—NOSE.

Frequent Causes and the Treatment of Perennial Hay Fever.

Walker, Chandler.

J. Am. M. Ass., Chicago, 1920—LXXV—788.

Perennial hay fever is frequently caused by animal emanations, and cutaneous tests should be made with the common animal epidermal proteins.

Those patients whose hay fever is caused by exposure to horses may be successfully treated by repeated inoculation in gradually increasing amounts of the particular epidermal protein to which they are most sensitive.

Those patients who are sensitive to cat hair protein may be treated similarly with equal success. Dispensing with the cat, however, is easier of accomplishment and is usually beneficial.

With those who are sensitive to the epidermal proteins of other animals (pets) it is preferable to avoid that particular animal. Sensitization to feather protein from feather pillows is frequent, and the substitution of floss pillows is desirable.

Perennial hay fever is frequently caused by the ingestion of foods and by the inhalation of the cereal grain flours. Cutaneous tests often reveal such a cause, and omission of the protein is the desirable mode of treatment.

Patients who have seasoned pollen hay fever frequently have paroxysmal symptoms throughout the year. Satisfactory preseason treatment with the particular pollen that causes the seasonal hay fever frequently relieves the perennial symptoms.

Recurring head colds are frequently coincident with the foregoing sensitizations, and relief from these head colds usually follows proper treatment, as already outlined. This type of head cold is probably not due to an infection but rather a result of sensitization which renders the nasal mucous membrane easily irritable.

Nonsensitive patients with perennial hay fever or vasomotor rhinitis, provided there are no demonstrable abnormalities, growths and the like in the nasal cavities or sinuses, are sometimes benefited or relieved by autogenous vaccines made from the nasal secretion. The same statement also holds true for those patients who are subject to frequent head colds.

Olfactory vasomotor rhinitis, or pseudo hay fever, caused by mechanical, thermal, chemical and odorific irritants, is not uncommon and should be recognized.

The ingestion of foods may cause symptoms referable to the eyes alone. Therefore, although protein sensitization should not be considered as a "cure all" or a cause of all obscure conditions, the cutaneous test for protein sensitization deserves a place among diagnostic tests, and when properly performed and interpreted, it is a very useful test. Emil Mayer.

A New Operation for the Relief of Dacryocystitis Through the Nasal Route.

Wiener, Meyer, and Sauer, William E.
J. Am. M. Ass., Chicago, 1920—LXXV—871.

A Ziegler probe is introduced through the inferior canaliculus into the lacrimal sac. The probe is then directed downward until it reaches the bottom of the sac, when it is turned inward at an angle of 45 degrees and then forced through the external nasal wall into the nasal cavity. In some cases a punctum dilator must be used before the Ziegler probe can be introduced. In a few cases we were unable to introduce the probe through the lower canaliculus, but had no difficulty in going through the upper one. In none of the cases did we find it necessary to slit the punctum.

The probe enters the nasal cavity just in front of the anterior end of the middle turbinate. In some cases in which the middle turbinate is large, a portion of the anterior end must be removed

immediately preceding the introduction of the probe. In cases in which the nose is narrowed by a septal deviation, a submucous resection must precede this operation, but in the majority of cases this is not necessary.

The next step is to withdraw the probe partially, having enough of the point visible in the nose to serve as a guide for the removal of as much of the bony covering of the canal and lacrimal sac as is necessary to establish a permanent opening. The opening made by the probe may be enlarged with a small punch forceps or chisel. In some of the cases we have been able to enlarge the opening by introducing a Hajek hook and turning the point upward, and with a little pressure medially fracturing the nasal wall of the sac and then removing the fractured bone with small biting forceps. In some cases a chisel curved on the flat has been used when the bone is unusually thick. The bony opening is extended upward so that the probe may be introduced into the nose almost at right angles. That is, the handle of the probe, instead of being almost vertical as when pushed into the nose, may be introduced in a horizontal position. It will now be found that a portion of the sac may be pushed through the bony opening into the nasal cavity; with the sac held in this position, biting forceps are introduced into the nose, and as much of the sac as possible is grasped between the jaws and held there until the probe is removed, and then the jaws of the forceps are closed, biting out a portion of the sac.

The bleeding usually is very slight; in no case has packing been required. The patient is not disturbed until the third day, when a No. 4 Bowman probe is introduced into the nose. This is repeated every third day or oftener, depending on the tendency of the opening to close. Granulations are kept down by means of a 40 per cent solution of silver nitrate until the wound in the nose is entirely healed. The introduction of the probe and the applications of the silver solution are the chief points in the success of the operation. If these cases are not carefully watched after the operation, the opening quickly closes. Emil Mayer.

Closure of Fistulous Openings Through Alveolar Process Into Antrum of Highmore.

Welty, Cullen F.

J. Am. M. Ass., Chicago, 1920—LXXV—867.

Under general anesthesia, an incision was made at each end of the fistula on the outer side of the alveoli, and carried well up to where the bone had been removed in the antrum of Highmore operation. Periosteum and mucous membrane were removed from the alveolus, and afterward the whole of the outer border of the alveolus, into the antrum of Highmore. A similar incision was made on the inside at each end the fistula, periosteum and mucous membrane elevated from the bone, and the bone removed. By this time we had an opening an inch and a half long, into which the finger could enter the antrum of Highmore.

An incision was now made in the median line of the hard palate its entire length, and the periosteum elevated over the entire area. It is easy to understand that by this procedure all tension will be

removed when sutures are introduced. That the sutures may not cut the tissue, two perforated lead disks are used on each side and the sutures tied rather snugly. This can remain for ten days, when it wil be found that the union has been complete.

There are many persons about the country suffering from a fistulous communication with the antrum of Highmore who can be readily cared for in the way described. Emil Mayer.

Inoculation Against Hay Fever.

Walter, Will.

J. Am. M. Ass., Chicago, 1920—LXXV—671.

We give no more large doses at season and am withholding all preseason inoculation with ragweed pollen protein.

It being a well established principle that anaphylatoxic poisoning is best met by increasing blood alkalinity and by administration of minute doses of homologous protein, we adopted an alkalin dietary and regimen, and the frequent use of fractional doses of pollen protein hypodermically in all cases at season.

The results so far have been universally encouraging.

Emil Mayer.

III.—PHARYNX AND MOUTH.

The Tonsil in Relation to Infectious Processes.

Davis, John David.

J. Am. M. Ass., Chicago, 1920—LXXIV—317.

In order to understand clearly the genesis of certain diseases it is necessary to study intensively a suspected focus of infection, like the tonsil, in both normal and infected persons.

Lymphoid structures attain two maxima of distribution: one in the throat and another in the region of the ileocecal valve and appendix; these maxima correspond in general to the normal distribution of bacteria in the alimentary canal. At these points also the greatest number of pathogenic microorganisms attack the body. Plasma cells appear shortly after birth (therefore after infection) under the mucosa, and their presence probably indicates chronic absorption of infectious and other material.

Certain organisms injected into the crypts of the tonsils disappear in a few days. The flora normally found in the tonsils is a restricted one.

Actinomyceslike granules, composed of fusiform bacilli, streptococci and spirochetes growing together, appear as more or less normal inhabitants of the crypts. Here may be an important source of bacillus fusiformis in certain infections about the mouth caused by this organism.

In the tonsil crypts streptococcus hemolyticus is almost constantly found. This focus is one source of these organisms in the throat and adjacent structures. This fact may be considered in making throat cultures and in a study of the problem of hemolytic streptococcus carriers. Emil Mayer.

Hemolytic Streptococci in the Normal Throat After Tonsillectomy.

Van Dyke, H. B.

J. Am. M. Ass., Chicago, 1920—LXXIV—449.

In the series of tonsillectomized throats of individuals in good health it was found that in nine, or 16.4 per cent, there were markedly hemolytic streptococci resembling Brown's Alpha prime throats, were the less markedly streptococci resembling Brown's Alpha prime type. Thirty, or about 55 per cent, of the throats examined revealed no hemolytic streptococci. There seemed to be no significance in the time elapsing between the removal of the tonsils and the bacteriologic examination of the throat for hemolytic streptococci. In several of the cases the Beta type of hemolytic streptococci was present, in the absence of clinically visible changes in the throats. The fermentation reactions of these streptococci were typical of hemolytic streptococci. According to the classification of hemolytic streptococci by fermentation reactions as suggested by Holman, the organisms tested would be divided into two groups, streptococcus anginosus (fermenting lactose but not mannite and salicin) and streptococcus pyogenes (fermenting lactose and salicin but not mannite).

The method employed in this work differs from the work of most investigators in that a routine preliminary cultivation of the throat cultures in blood broth was made. While some reports mention streptococci whose hemolytic action is incomplete (Alpha prime type), none give very definite data on the proportion of such organisms. The Beta type of hemolytic streptococcus is probably the type referred to by most authors as hemolytic. Hence the findings, namely, that 16.4 per cent of the tonsillectomized throats harbored markedly hemolytic streptococci, while higher than those of Tongs and lower than those of Simmons and Taylor agree quite closely with the observations of Nichols and Bryan, and Pilot and Davis. Emil Mayer.

IV.—LARYNX, TRACHEA AND ESOPHAGUS.

Fibrotuberculoma of the Larynx.

Portmann, George.

Presse méd., Paris, 1920—XXVIII—101.

Tuberculosis does not only produce limited neoplastic manifestations but also the large laryngeal tumor which in growing invades little by little the vocal organs and the surrounding tissues.

It is this type of tumor, peculiar as to histopathologic structure, which shows clinical manifestations which are so alike that they may be mistaken for those of a neoplasm, which the writer describes fibrotuberculoma of the larynx.

He makes a complete clinical, anatomopathologic table.

The functional symptoms are those of all laryngeal tumors, disphony and hoarseness at the beginning, then raucity and aphony when the tumor has increased in size and respiratory troubles and attacks of suffocation appear.

An important sign is that the fibrotuberculoma never produces real pain. Objectively a localized tumor is observed in the different stages of the affection, the seat of which is variable, but well marked at first and which little by little spreads to the adjoining tissues.

Within the larynx it spreads beyond the organ and progresses towards the exterior.

The fibrotuberculoma, the evolution of which is nearly always very slow, is composed of the fibrous tissue, in which typical tubercular "follicules" are found, either alone or agglomerated.

Its diagnosis being difficult in the beginning with mild tumors, the syphilitic gum and especially with advanced cancer, can only be ascertained with certainty after a biopsis and a histologic examination.

The tumor, though not dangerous at first on account of its slow development and of the general good health, may become so by the obstacle that it forms to the passage of air.

Justifying an endolaryngeal intervention in the beginning, the fibrotuberculoma can thus be cured without danger of a relapse. If the endolaryngeal operation is no longer possible on account of the extension of the lesions, all partial or total laryngectomy must be abstained from and palliative tracheotomy performed.

As the writer remarks, cases of fibrotuberculome mistaken for cancer and operated upon as such are doubtless more numerous than the medical world supposes. His work is another proof that no intervention can be practiced on a larynx without a previous histologic examination.

Dangers, Failures and Difficulties in Foreign Body Bronchoscopy: A New Instrument for Their Elimination.

Goodloe, A. Ellis.

Am. J. Surg., N. York, 1920—LXXIV—207.

The instrument presents the following features:

1. A combined bronchoscope and forceps so constructed that it will grasp practically any object of any shape and any size that may find its way into the trachea or bronchi, doing away, in the majority of cases, with the use of forceps of many and various shapes and sizes, which are used through the barrel.

2. Vision is had at all times, whether the forceps is closed, being opened or open, as there is no instrumentation through the barrel.

3. There can be no shadows cast upon the object on the field of operation or within the barrel.

4. It will grasp and hold almost any object, whether hard and round like a glass ball, or a soft substance like the peanut, for it does not depend upon the same principle as other forceps. It has only one thin jaw which passes over the object and closes up the tube behind and, by its lifelike motion, it works objects up to the barrel, and, if small enough, into the barrel.

5. It is easy to tell when arriving at the object to be removed, as the forcep can be lifted up and down by the trigger-like motion of the index finger and the body thus seen to move.

6. There is much less danger of driving the foreign body further down into the deeper bronchi, as there is only one thin forceps blade, instead of two, to pass the object, and it is parallel to the wall of the bronchus.

7. Impacted bodies can be worked loose and the process watched while it is being done, by a simple up and down motion of the forceps blades, without disturbing the relation of the forceps blade to the end of the barrel or the object.

8. If secretions too thick and tenacious to be drawn through the suction tube get in the way obscuring the view, they may be pushed aside with the forceps blade.

9. Abscesses with small openings into the lumen of the trachea or bronchi may be opened and enlarged, allowing pent up secretions to escape.

10. While the bronchoscope is being withdrawn, with the foreign body within its grasp, it can be seen whether or not it remains within the grasp until fully withdrawn. This is not possible with the forceps which have to be used through the barrel. Often a foreign body has been lost during the withdrawal.

11. By regulating the friction control screw at the head, just sufficient tension can be obtained, not to crush soft bodies of vegetable composition, such as peanuts and beans. An extra strong grasp can be obtained by the process being reversed. This feature can also be controlled by the thumb control, without disturbing the screw.

12. Granulating tissue can be curetted away where the object has become embedded in it. The shape and size of the forceps together with its double motion makes it an excellent curette, when needed, and it is always there, ready.

13. Unless the secretions are exceptionally thick and tenacious, it is impossible to obscure the light, due to the mechanical arrangement of the light and the drainage tube. The opening of the drainage tube into the barrel is in front and at the apex of the light bulb, and the secretion is taken up before it reaches the light. Every part of the tube can be taken instantly apart for cleaning and sterilization.

14. It takes only one hand to operate.

15. If occasion should arise where the operator should choose to use forceps or hooks, they can be employed in the usual way, as the above added features have not decreased the lumen of the standard size bronchoscope, neither have they increased the size of the tube.

Emil Mayer.

V.—MISCELLANEOUS.

Enlarged Thymus Gland in Infancy and Its Treatment by Radium.

Brayton, Howard W., and Heublein, Arthur C.

Bos. M. and Surg. J., 1919—CLXXXI—26.

Med. Rec., 1920—XCVII—77.

The writers base this report on an experience of thirty-four cases of enlarged thymus treated with radium. In every instance there followed a prompt and lasting disappearance of all symptoms. The technic of the treatment is as follows: 100 milligrams

of radium element, still in its 0.3 millimeter silver capsule, is wrapped in sufficient gauze so that when strapped to the breast by a strip of adhesive it will lie a half inch from the skin surface. Four marks are made in the form of a rectangle over the thymic area and the nurse is instructed to allow the package to remain two hours over each mark. This makes a total exposure of 800 milligram hours. From the moment a diagnosis of enlarged thymus is made the child's head should be kept in a fixed position, thus lessening the severity of the asthma and the possibility of sudden death. Radium possesses the following advantages over the Roentgen ray in the treatment of these cases: The action of radium is more rapid: with radium one treatment alone suffices to effect a cure, even in the severest forms of the disease; radium is portable, thus obviating the difficulty of transporting the patient to a Roentgen laboratory; the application of radium is simple, thus eliminating the dangerous element of fear from the mind of the patient, and at the same time rendering unnecessary the use of an elaborate equipment and highly skilled operator.

Emil Mayer.

Frequency of Syphilis With Cancer of the Lips, Tongue and Buccal Mucous Membrane.

Cary, N. Austin.

J. Am. M. Ass., Chicago, 1920—LXXV—860.

Syphilis in association with cancer of the tongue is approximately three times more common than in association with cancer in other locations about the mouth—14.5 per cent, or about one in seven cases.

This very fact is urgent reason against protracted antisyphilitic treatment in tongue lesions which may be cancer, even in the presence of positive evidence of syphilis. Regardless of the causal relationship of syphilis to cancer, once a neoplasm has been established the prognosis is that of cancer and not of syphilis, and treating the syphilis will not affect the cancer, but will only delay urgently needed surgery.

Emil Mayer.

Radium in the Treatment of Malignant Tumors of the Nose and Throat.

Sonnenschein, Robert.

J. Am. M. Ass., Chicago, 1920—LXXV—865.

The writer presents the following conclusions:

1. The future of radium therapy seems very bright, particularly in reference to applications in tumors of the nose and throat; but great caution is advisable in statements regarding actual cures. It is important to watch for recurrences during a period of from two to five years.

2. In reporting cases, authors should give details of the preparation used, the method of application, duration of exposure, etc., in radium treatments.

3. Following up the cases and repeating on them again whenever possible is of utmost importance in the formulation of definite conclusions regarding the results of radium treatment.

4. Radium is probably of great value before, and certainly after operations. It is very efficient in relieving pain, hemorrhage, discharge, etc., in many inoperable cases.

5. Sarcomas are especially responsive to radiation; the carcinomas yield much less readily, and the squamous type of epithelioma is scarcely amenable to radium at all.

6. Complications, at least those reported, are not so frequent as one would be likely to expect. Burns were the most common ones, but even death may result from toxemia.

7. Radium has many advantages as compared with roentgen rays, especially for application in the nose and throat.

8. The diagnosis of the malignant cases should be made by a competent laryngologist, and the radium applied either by him or in cooperation with a radiologist. Only in this way will correct statistics and reliable results be obtained, with greatest benefit to the patient and the safest guidance to the profession.

Emil Mayer.

Mixed Tumors of the Thorat, Mouth and Face.

New, G. B.

J. Am. M. Ass., Chicago, 1920—LXXV—732.

Patients with mixed tumors usually come for examination because of recent increase in the size of the tumor, which has been present for several years. Thirty-three, nearly half of the tumors, had been present for more than five years before the patient came for examination. This type of tumor presents, clinically, a hard, nodular surface, with the feel of a malignant growth. Such tumors in the pharynx are usually located laterally, or bulging the posterior pharyngeal wall and the palate.

The patients, because of the slow growth of the tumors, accustom themselves to the gradual diminution of the air space and small space through which to swallow. It is remarkable that some patients are able to eat anything with the huge tumor filling the mouth and pharynx. In one the growth, which had originated in the hard palate, had extended upward and involved the entire antrum. When the tumors are situaed on the hard palate they usually cause a depression in the bone similar to that produced by a dermoid; as they become larger they may perforate the bone.

When in the parotid region they are freely movable at first, but after they increase in size they become fixed between the posterior margin of the ascending ramus of the jaw and the mastoid region; the facial nerve is sometimes paralyzed from the pressure by the tumor. In the one case in which the larynx was involved, the entire subglottic region was thickened but not ulcerated. The laryngoscopic picture was similar to that seen in two cases of amyloid tumor of the larynx. The patient had been gradually having increased dyspnea for eight years. Microscopic examination of the tissue determined the diagnosis in this case. The fact that there is never any close connection either grossly or microscopically between the salivary glands and the tumors seems to discount the theory that they arise from the gland substance; they are always surrounded by a definite capsule and not connected

with the gland. Grossly, they present a definite capsule, are rounded, smooth and lobulated. The slowly growing tumors are usually hard, while the rapidly growing ones are soft. Some are multiple. On section, they are granular in appearance with some cystic areas filled with serum. Microscopically, they present connective tissue and epithelium in the form of tubules. The majority of the tumors contain cartilage.

If the growth is in the pharynx and palate, the condition must be distinguished from a nasopharyngeal fibroma that has filled the nasopharynx and bulges the palate. In the parotid and submaxillary regions, tuberculous and inflammatory glands may simulate a mixed tumor.

The treatment of the mixed tumor is surgical. If the tumor is in the pharynx it should be removed either through the mouth or through the submaxillary and submental regions, depending on the size and location of the tumor. Of the four pharyngeal tumors for which the operation was performed, two were removed through the mouth and two through the submaxillary region.

Five of eighteen patients who, at the time of examination, had been operated on elsewhere had permanent facial paralysis.

This type of tumor should not be classified as mixed tumor of the salivary glands until there is some evidence to show that it is related to these glands. The tumor may be present in various locations in the throat, mouth and face. It seems that a favorable prognosis in these cases depends on the complete removal of the tumor at the primary operation, as the percentage of recurrence following complete removal is very small. Emil Mayer.

Postdiphtheritic Paralysis of the Respiratory Muscles.

Marriott, W. McKim.

J. Am. M. Ass., Chicago, 1920—LXXV—668-669.

About one week following the attack of diphtheria the child began to show signs of palatal paralysis. The muscles of the eyes, extremities, back and neck subsequently became paralyzed.

The child's respiratory difficulties increased. No motion of the diaphragm could be detected, and ultimately the intercostal muscles and accessory muscles of respiration became involved. Cyanosis deepened and the child became semicomatose. There were no signs of pneumonia or of obstruction in the air passages. It was evident that death from suffocation would result within a very short time unless some means of artificial respiration were employed.

Use was made of an apparatus described by Gesell and Erlanger. This apparatus was designed to convert a continuous air current into an intermittent one of any desired rate and volume, and has been used extensively in physiologic laboratories for administering artificial respiration to animals. A nitrous oxid mask connected to the apparatus was applied closely to the child's face. There was at first no cooperation, partly on account of the child's semicomatose condition. Within a few moments, however, the slight cooperation necessary was obtained, and air was forced into the lungs. The effect was almost immediate; cyanosis disappeared, and

the patient became sufficiently conscious to cooperate well. The rate of respiration of the machine was adjusted to correspond with the child's respiratory efforts. After a period of about ten minuets the child fell asleep and the mask was removed. Cyanosis slowly developed again and was again relieved by a period of artificial respiration. The artificial respiration was kept up during most of the time that the child was awake. It was possible to discontinue it for short periods when she dropped off to sleep. The artificial respiration was kept up at intervals for five days, and at the end of that time the respiratory muscles had so far regained their function that the artificial respiration was necessary only at relatively infrequent intervals. It was not neecssary at all when the child was perfectly quiet; but after any exertion, such as coughing or after feeding with the nasal tube, it was necessary to apply the respiration apparatus for a short period. The function of the respiratory muscles steadily improved, and at the end of a week it was possible to dispense entirely with the artificial respiration. The child was discharged from the hospital January 31, in excellent condition. She is now (six months later) well and apparently normal in every way. Emil Mayer.

SOCIETY PROCEEDINGS.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of December 1, 1919.

THE PRESIDENT, DR. ELMER L. KENYON, IN THE CHAIR.

Bone Transplant in the Nose.

Dr. George W. Boot presented a patient with a bone transplant in the nose, (2) a patient who had suffered with cerebral hemorrhage, and (3) a case of brain abscess.

Case 3.—The patient was a woman, aged 35, married and the mother of two children. She complained of dizziness and of pains in the left ear.

The left ear began to discharge with an attack of scarlet fever at the age of 12. The discharge ceased after a time, but began again at the age of 29 and has persisted ever since. She was referred to Dr. Boot to have a radical mastoid operation to put an end to the discharge and to the dangers of a chronic suppurative otitis media.

Accordingly, a radical mastoid operation was done. During the operation the dura over the tegmen antri was exposed but was not injured in any way. The antrum was very small, and the mastoid was eburnated from the long continued discharge.

She did very well after the operation until the eighth day, when she complained of a bad headache, for which she was given phenacetin in five grain doses.

On the ninth day she appeared somewhat stupid in her actions and would not protrude her tongue when told to. She did not complain of headache, and no disturbance of speech was noted other than what seemed attributable to her rather stupid condition. She appeared obstinate rather than aphasic. Her temperature at this time was 98.6 and her pulse 60.

On the tenth day her morning temperature was 98.6 and her pulse 60. She was decidedly stuporous. She would not protrude the tongue, and when she talked she acted decidedly sleepy. The nurse reported her talk as irrational at times. There was no rigidity of the neck and Kernig was absent. There was no vomiting. Lumbar puncture gave a clear fluid with no appreciable increase in pressure. There were 132 cells to the cubic millimeter of the spinal fluid. The pupils were equal and reacted to light. The eyegrounds were negative except for a slight fullness of the veins. There was no choked disc.

On the eleventh day she was still more stuporous. Babinski and Gordon reflexes were found positive, and all the deep reflexes were somewhat increased. At this time it was found that light thrown into the right eye from the right gave no contraction of

the pupil, while light thrown into the right eye from the left caused contraction. The left eye was not responsive on account of a mydriatic having been used the preecding day. It was difficult to get her to reply to questions. There was no nystagmus.

A diagnosis of abscess of the left temporosphenoidal lobe was made. Operation was done a few hours later. The mastoid wound was reopened and the tegmen removed over an area 1.5 to 2 cm. in diameter. The granulating dura was incised and the searcher passed upwards about 1.5 cm., when there was a gush of thin brownish pus about 15 to 20 cc. in amount. This was accompanied by considerable bubbling and a foul odor as if from a colon bacillus infection.

A split rubber tube was introduced to the depth of the abscess cavity and dressings applied. The following morning she was quiet and apparently better, but did not speak. During the afternoon she awoke from sleep and spoke quite rationally, and from this time on she improved steadily until she is as you see her now, completely recovered with the ear quite dry.

The symptom to which he called especial attention was the loss of reflex contraction of the pupil when the light was thrown on the half of the retina supplied by the left cerebral hemisphere.

DISCUSSION.

Dr. Stein asked whether Dr. Boot had any special object in transplanting the pieces of tibia in the nose case in two stages, or whether it was an afterthought, and also why he used tibial bone in place of rib. He thought there was a depression just above the tip of the nose.

Dr. Boot said that it was an afterthought, but he believed it was better to do it in two stages than to have to remove some of the bone. He expected to put in a wedge shaped piece later to remedy the depression referred to.

Dr. Long said he had done some similar work. In one case he dissected around the nares, dissecting the skin up to the bridge of the nose, and took a strip of the eighth rib, containing bone and cartilage, and inserted it beneath the skin along the top of the nose. This procedure obviated a scar over the bridge and gave a large high nose, which was the object of the operation. A small portion of the bony rib was cancellous, and some days later the skin over this spot became red, and a small area of fluctuation appeared; an incision was made and a few drops of pus were removed. Daily dressings for ten days resulted in a complete closure of the wound, and the patient was discharged with a perfectly normal nose, as I hope to show you at some future time.

Dr. Boot said one reason that he did not take a piece of rib for his work was because in a similar case another laryngologist took a piece of rib, and an empyema developed which required a couple of operations by a general surgeon.

Bullet Wound of Larynx.

Dr. Edwin McGinnis presented a soldier who had been shot through the neck at the battle of the Argonne. The following day

a tracheotomy was performed; five weeks afterward the tube was removed and for ten days the patient apparently did well. He then became short of breath, the tracheotomy was repeated and the tube reinserted. Following this he wore the tube for a year. The bullet had passed through the ventricle, and there was a band of adhesions from one side to the other with a very small opening. He could breathe fairly well through the larynx with a cork in the tracheotomy tube, but did not get enough air to enable him to run or go upstairs. In February, 1919, the scar tissue was incised and bougies were passed. In October he made an effort by the indirect method to cut out the scar, but this was unsuccessful, so the suspension operation was resorted to on the 16th of November and the scar was dissected out with both hands, using grasping forceps and a long scalpel, leaving a clean looking larynx. At the time of presentation the tube had been removed for a week and the larynx looked almost normal. No intubation tube had been used after the operation; there was no edema and very little swelling following the operation.

Dr. L. W. Dean and Dr. M. Armstrong, Iowa City, Iowa, presented a paper entitled

"The Occasional Necessity of Doing Radical Operations on the Paranasal Sinuses in Children, with Illustrated Cases."*

DISCUSSION.

Dr. Sonnenschein said that he had recently visited Dr. Dean and witnessed the excellent work he was doing. The prevailing notions that he and many others had had concerning the size and development of the sinuses in early childhood had been changed through reading Dr. Dean's articles in the last few years. While it was true that in the majority of infants only the antra and ethmoids were developed to any extent, it had been shown by a number of men that it was possible to have very large sinuses in early childhood. The frequency of the inflammations and the bearing they had upon arthritic changes, he thought, could not be better emphasized than by the work Dr. Dean had done. He had seen the two cases reported and wished to testify as to the thoroughness and conservatism with which they were handled by Dr. Dean. In puncturing the antrum, even in small children, by rotating the inferior turbinate and conserving all the mucosa and ciliated epithelium there, he thought the Doctor had done excellent work. The patients were certainly much improved over their status of a few months before, and he could not think of any more important work than calling attention to this region in connection with infected sinuses, especially in the cases in which tonsils and adenoids had been removed.

Dr. Beck said that two men in this country had given attention to infectious diseases in children, Dr. Dean and Dr. Oppenheimer in New York. Dr. Oppenheimer several years ago presented an article on sinusitis in children, which had been overlooked by the

*See page 602.

majority of ophthalmologists, who considered it a useless proposition to try to do anything with the sinuses in children. The reason was that in the discussion of this paper the proposition of doing any active surgical work on children was so unfavorably considered that it was put aside, and not until Dr. Dean and Dr. Oppenheimer presented their papers, with extensive laboratory work, did the men begin to take it up. In the meantime Dr. Coffin of New York presented a number of cases of diseased sinuses in children, in which very successful work had been performed with a suction apparatus which worked successfully in his own cases and many others. Dr. Beck had shown many X-ray pictures of children with infected sinuses, many with large frontal sinuses. and many different pictures of the sphenoid sinuses. Dr. Dean, who had worked a great deal in developing the accessory sinuses in children, had shown that the current belief regarding the sinuses was anatomically wrong. The speaker had no experience in operating in arthritis in children, such as Dr. Dean described. Puncturing the antrum was probably the limit of his work, except in asthmatics. He had done a good deal of work on nonsuppurating cases and had found a good many of them infected. He thought the work of Dr. Dean was admirable, and had made the profession look for sinus disease. He believed it would be well for the pediatricians to be made acquainted with this work.

Dr. Norcross asked Dr. Dean to tell something of the less radical treatment in childhood, and whether in a young child the ordinary procedure of puncture was done without anesthetic or if the children were put to sleep.

Dr. Robertson thought the paper was very appropriate at this time. The pediatricians and general practitioners had received the impression that rheumatism, if not a gastrointestinal affair, must be tonsillar or dental. He had expected to hear Dr. Dean call attention to younger children; a child of fourteen was nearly adolescent and should have almost as large sinuses as a man of twenty-one. He had heard of children of seven being operated on for sinus trouble and in one instance no sinus was found. The sinuses vary in different individuals as to their appearance; some come very late, whereas others are developed at a much earlier age. At birth, the largest sinus of all, the antrum of Highmore, is nothing more than a slit internal to the infraorbital canal, which gradually descends, and after the upper teeth are erupted the sinuses develop. He believed the size of the sinus was represented by the growth of the face, and before the face was formed no one could expect to find much of any sinus. In growing children the bones of the ear were almost as large as in the adult. He thought there were many cases which were operated on and relieved of infected foci. The general belief was that the tonsils and the teeth were largely the faulty agents, whereas on looking through his cases a large number were found to have discharges from the nasal and accessory sinuses, particularly the ethmoid cells.

Dr. Robertson thought Dr. Dean should be complimented for the way he had worked out his material. He thought the paper would do everybody good and would stimulate members to take up the work and try to do it as well as Dr. Dean had.

Dr. Pollock said that two years ago he had a patient, aged six years, who was troubled with a "running nose," especially in winter. Examination showed the typical degenerated tonsils and adenoids, which he removed. He saw the patient at intervals afterward and he was apparently cured. Three months previously the mother had brought the child, now eight years old, with a unilateral discharge from the right side. He immediately thought of a foreign body, but careful examination revealed nothing. Transillumination showed the right sinus dark and the antra on both sides quite large. This was the first time that he had discovered definite antrum trouble in a child. He irrigated the antrum with a small trocar. The child made no complaint and the procedure was repeated seven or eight times, every second day, until the discharge ceased. Two weeks later a radiograph showed a slight shadow, so he irrigated again but found no pus. The pus showed staphylococcus. Since then the patient has been perfectly well. He had discussed the case with several colleagues, but had found no one who had ever irrigated an antrum in a patient younger than eight years.

Dr. Maclay emphasized the amount of time Dr. Dean had spent before coming to the opinion that radical work should be done. The cases were carefully examined and treated without any operative procedure for weeks before surgical interference was suggested. The medical profession swung in extremes, and when this paper was read by the various laryngologists in the country and they saw that such work was productive of good results, many operations would be done, hoping for such results as those obtained by Dr. Dean. No doubt extreme care must be exercised in order not to traumatize these young and delicate sinuses. He thought the profession should bear in mind the time spent before deciding to do radical work. Other lines of treatment should always be tried and many cases would clear up. In many of his own cases he had watched children clear up when the trouble had looked rather severe, and he felt that this point should be emphasized

Dr. Dean (closing) said he was glad to have Dr. Maclay call attention to the length of time cases with nasal sinus disease should be studied before deciding upon the radical operative procedure. He felt that every one of us was opposed to extensive operations upon the nasal sinuses, even in the adult. It was doubly important to avoid radical operations in children; first, beause of the deleterious effects that must result from such operations, and second, because almost all of the cases could be cured without extensive operative procedures.

He was glad Dr. Beck mentioned the work of Dr. Oppenheimer and that of Dr. Coffin. Coffin was one of the pioneers in this field. Oppenheimer has done most excellent bacteriologic work.

In regard to methods of treatment, he felt he was not ready to answer the question definitely at this time. Considerable research work along this line was being done at the University of Iowa, and he expected to report it in the spring.

He called attention to the great care necessary in the puncturing or washing out the Highmorian antra in infants. If the wall of the antrum was scratched, osteomyelitis might develop. In punc-

turing and irrigating the Highmorian antra in infants he used chloroform anesthesia, and always had before him an X-ray plate of the sinuses in order to know just where the sinus was and its outline. He did not consider it safe to puncture the Highmorian antra in infants without having the X-ray plates before him.

He was glad to hear from Dr. Robertson. One of the patients mentioned was twelve and the other thirteen. He realized they were getting near the dividing line between childhood and adolescence.

In puncturing he used a needle with a caliber of one and one-half millimeters. Before introducing it the inferior meatus was cleansed with 95 per cent alcohol. The needle was then passed into the antrum underneath the inferior turbinate. A second fine needle was then introduced into the antrum through the first. Attached to the second needle was a syringe containing about a dram of sterile water. This water was injected into the antrum, washed around and then aspirated. In this way material for culture was secured. If methylene was applied about the ostium of the sinus before investigating it, the methylene blue did not make its appearance in the washing. Again, the normal antra have been found sterile. These two things indicated that the technic was exact. After securing the solution a silver preparation was usually injected into the antrum.

Dr. David J. Davis presented a paper on

"Some Observations on the Bacteriology of the Palatine Tonsils."

Attention was called to the necessity of studying intensively a suspected focus of infection like the tonsil in both normal and infected persons.

Lymphoid structures attain their maxima in the throat and in the region of the ileocecal valve and appendix, and these maxima correspond in general to the normal distribution of bacteria in the alimentary canal. At these points also the greatest number of pathogenic microorganisms attack the body.

Plasma cells appear shortly after birth (therefore after infection) under the mucosa, and their presence probably indicates chronic absorption of infections and other material.

Certain organisms injected into the crypts of the tonsils disappear in a few days. Miss Sexsmith showed that B. prodigiosus after injection had completely died out at the end of the fourth day. B. pyocyaneus had disappeared by the fifth day. The flora normally found in the tonsils is a restricted one.

Actinomyces-like granules composed of fusiform bacilli, streptococci and spirochetes growing together appear as more or less normal inhabitants of the crypts. Here may be an important source of B. fusiformis in certain conditions about the mouth caused by this organism.

In 1912, in studying the bacteriology of the tonsils from various diseases, including arthritis, nephritis and myocarditis, the writer was struck with the common occurrence of typical hemolytic streptococci in the crypts, often in pure culture, whereas on the surface of the same tonsils they were often few or absent, while the green producing cocci predominated. In forty-eight cases of the fore-

going diseases the hemolytic streptococcus was predominant or abundant in forty-five, or 94 per cent. In a series of sixty-one pairs of tonsils, which were extirpated mostly from children for various reasons, chiefly hypertrophy, many appeared quite normal, and hemolytic streptococci were found practically as often, namely, in fifty-five, or 90 per cent. In subsequent work the cultivation of numerous tonsils from a variety of diseases had convinced him that the crypts of the tonsils are in almost all cases the habitat of many hemolytic streptococci, often almost pure. Pilot and Davis have again recently investigated this matter and compared the tonsillar crypt flora with throat swab and tonsil surface cultures. Briefly, in one hundred cases of ordinary hypertrophy without inflammation, the pharynx was positive for hemolytic streptococci in 43 per cent and the tonsil surface in 61 per cent, and in these the hemolytic colonies numbered less than 10 per cent of the total number of colonies. In the crypts of the same tonsils after extirpation the hemolytic streptococci were found in 97 per cent of the tonsils and in most of these were greatly predominant. Furthermore, they found that in twenty-four normal persons cultures from the surface of tonsils revealed hemolytic streptococci in 58 per cent, usually not predominant. In nineteen persons without tonsils, cultures from the pharynx and tonsillar region yielded hemolytic streptococci in only three, or 15 per cent. The recent work of Nichols and Bryan in the United States Army was quite in accord with these data and indicated that the crypts of the tonsils are a common habitat for hemolytic streptococci.

The hemolytic streptococci found in tonsils and in throats of apparently normal persons seem to be typical in every respect. For rabbits many of them are distinctly pathogenic, as pathogenic as many strains from sore throats or from abscesses. According to Holman's classification, they would fall chiefly into the S. pyogenes and S. anginosus groups.

He knew of no other anatomic structure or location in the body that so consistently harbored hemolytic streptococci as do the tonsillar crypts. In the nose they are rare. He had never found them persistently present in a normal nasal mucosa, and their presence there meant almost surely an infection, usually an infected sinus. In the pharynx of normal persons, as they have seen, they are found roughly in between 50 and 60 per cent, but in the absence of inflammation not in large numbers. He raised the question as to the possibility of the tonsil crypts being the chief feeding focus of hemolytic streptococci for the throat and the respiratory passages. In a few cases in which he had examined adenoids he was not convinced that they were an important habitat for streptococci, though they might be found in moderate numbers in the hypertrophied tissues. About the mouth and teeth infected foci may commonly be feeders of streptococci for the throat; but the normal gums do not harbor them in large numbers. The skin of persons who bathe regularly rarely harbors hemolytic streptococci. Schachter found no hemolytic streptococci on the bodies of thirty-eight clean persons; whereas, he isolated hemolytic streptococci from the skin eight times from eighty-nine filthy persons, usually from the hairy parts of the body. They were not numerous,

but were typical and virulent for rabbits. The source of such organisms might very well have been the buccal secretions. Hemolytic streptococci, when placed experimentally on the human skin, usually disappeared in a few hours and were readily removed by washing. The gastrointestinal tract seemed to be quite free from hemolytic streptococci, at least normally.

Summing up these observations on the distribution of hemolytic streptococci, the facts pointed strongly to the crypts of the tonsils as being the main and in a sense a normal habitat of these organisms in the human body. Perhaps they were as normal to the tonsil crypts as was streptococcus viridans to the buccal mucosa, staphylococcus albus to the skin, or the colon bacillus to the intestine. From here they might be disseminated to adjacent tissues, ready possibly to take advantage of certain conditions, especially diseases of the respiratory tract, and give rise to secondary infections of a most serious nature.

The question arose as to whether or not persons were commonly or usually infected with their own hemolytic streptococci (endogenous) or were the invading streptococci in infected persons of foreign origin (exogenous). No doubt the latter statement was often true, as seemed clearly proved in the case of sore throat epidemics of milk origin. Furthermore, many facts pointed to the common dissemination of streptococci by means of droplet infection. The route of infection was not so clear, however, in secondary streptococcus infections following other diseases. In the common terminal infections so often due to this organism there was little doubt that the individual was killed by his own streptococci. It had been pointed out that such streptococci were as virulent as epidemic streptococci for man, especially after growing in the body for a time. It seemed reasonable to assume, as had been assumed by some in connection with the epidemics of streptococcus empyemas in the military camps in 1917, that individuals are infected from time to time with their own streptococci, especially following the contagious diseases, and that by this process the streptococci become more and more virulent and aggressive, reaching a point ultimately at which the small doses contained in infected droplets in eating utensils or in other vehicles are sufficient to transmit the disease to a normal person. Thus a secondary invader might become transformed into a dangerous primary infective agent.

DISCUSSION.

Dr. Norcross said that a number of years ago that article was published in which the removal of the tonsils was advocated in every child who had reached four years of age. The author stated that he had never seen a child have diphtheria who had had his tonsils removed. Dr. Norcross felt that most of the serious complications which follow infectious diseases in childhood were associated with streptococcic infection, and while the primary disease might be mild, the complications might be quite severe. There seemed to be a symbiosis between the streptococci and the invading organism. Dr. Davis stated in his paper that nearly 100 per cent of the cases examined contained hemolytic streptococci, so

that by the removal of the tonsils the danger of secondary infection would necessarily be decreased. If practically all the tonsils contain hemolytic streptococci, there would be no reason for making a bacteriologic examination of the tonsils before removal. If, however, the different strains of streptococci could be differentiated very often, but to, as Dr. Norcross had suggested, allow Dr. Davis so that one could identify the virulent from the nonvirulent, then a bacteriologic examination of the tonsils would be helpful. He hoped that Dr. Davis would soon be able to report that such differentiation could be made.

Dr. Hayden felt that the society was greatly indebted to Dr. Davis for his scientific work. He did not agree with Dr. Norcross in suggesting that further routine examinations of the tonsils were not necessary, but thought that in the light of Dr. Davis' work the most careful and minute bacteriologic examination was still in order, not to demonstrate that certain organisms were found but to differentiate between these streptococci until the pathogenic ones could be recognized.

In regard to finding spirochetae in tonsils, an experience of Dr. Hayden's some years ago might be of interest. A man who was doing many tonsillectomies sustained a wound of the right index finger. About three weeks later a nurse called his attention to the fact that the finger had not yet healed. The following day some scrapings were made of the sore and very active spirochetae were found. They were not of syphilitic origin, as laboratory tests proved, and subsequent Wassermann reactions, and evidence of any form of syphilis was entirely absent. This was five years ago. Dr. Hayden had never heard of any syphilitic infection being sustained in this way.

Dr. J. Holinger stated that he had had occasion often to talk this matter over with Dr. Davis when Dr. Davis was pathologist to St. Joseph's Hospital. At that time they could not see so clearly, and they did not have the epidemic with the great amount of good work which threw light in many dark corners and which so effectively drew attention to the hemolytic streptococcus. Going back to the original theory of Pfeifer that the influenza bacillus opened the road for the streptococcus to enter the body and then disappeared, that originally the influenza bacillus was, if not harmless, possessed of only a very brief pathogenicity, but that after disappearing many other organisms were found in the throat and mouth and caused other infections. Dr. Davis had presented valuable facts. Were there any tests made with remedies for diminishing the flora in the mouth and throat? A comparative study of the flora of the mouth, throat and crypts after different applications with swabs and atomizer would be of interest, especially their influence on the contents of streptococcus hemolyticus. He thought this might not be a waste of time and energy. He had the impression that a number of surprising facts might be brought to light. He based this impression on an experience on his own person. During a very bad attack of pharyngitis and tonsillitis he had used swabs and applications of different kinds, weak and strong solutions of nitrate of silver, of bichlorid, Lugol's solution, etc. By long contact of the swabs with the infected tissues the attempt

was made to reach the organisms in the tissues. All without avail. Finally an atomizer with equal parts of peroxid and water gave more relief in an hour than all other medications in ten days. In other cases he saw similar results. Of course, he did not mention this to advertise the use of peroxid, but it seemed peculiar that a remedy with such superficial action should be efficient at the same time that others failed which were calculated to reach the depth of the tissues if the infection was located deep in the tissues and in the crypts, as Dr. Davis demonstrated.

Dr. George W. Boot thought some of the speakers had the idea that the streptococcus was present in all tonsils and justified their removal, and asked whether the presence of the staphylococcus albus on the skin of all patients would justify removing the skin, and the presence of the colon bacillus in all colons would justify removal of the colons.

Dr. Davis (closing) said that the differentiation of various strains of hemolytic throat streptococci had been and then was a burning question. So far, satisfactory results had not been obtained. From the normal throat and tonsils one recovered hemolytic streptococci quite like those from pathologic tonsils and throats. Both might be equally virulent for various experimental animals. There seemed to be little parallelism between the virulence of hemolytic streptococci for the human and for many animals. According to certain recent workers, the streptococci fell in more or less definite groups or types, but these had not been correlated definitely with virulence for humans or animals or with definite clinical infections or pathouogic lesions. It would appear that the virulence of these cocci was a transient and variable characteristic at times. It would also appear that their aggressive powers might depend largely upon certain delicate and fluctuating factors resident in the host. Similar problems arose in connection with studies on staphylococcus and colon bacillus infections. In the solution of such problems both the properties of the bacteria and the properties of the host had to be carefully taken into consideration.

As to the diminution of the streptococci in the mouth, he thought the simple method of keeping the mouth clean, particularly the teeth, would diminish their numbers. The crypts in the tonsils were difficult to clean. It had been observed that individuals who were without tonsils were relatively free from hemolytic streptococcic infection of the throat, or if they acquired it they recovered more promptly. Normally, too, they had far fewer hemolytic streptococci.

Dr. Davis stated that he was not interested in this question from the standpoint of the practice of medicine, and the studies were not made from that viewpoint. He did not wish to be understood as advocating any such procedure as universal tonsillectomy; he did not feel competent to make any statement about it at present. Because there was evidence that practically all tonsils are infected did not mean that they should all be extirpated.

The whole problem of tonsil infections was in a very unsatisfactory state, and he felt that bacteriologic examination, as at present made, did not mean very much. If in the tonsils a definite abscess containing pus was found and there was an associated path-

ologic condition suggesting a relationship surgical procedure would be justified.

One should always take into consideration the clinical, the bacteriologic and the pathologic features in all cases when making a diagnosis and considering treatment, and should not rely on a bacteriologic examination alone.

Dr. Alfred Lewy asked whether experiments had been made on animals to determine whether the bacteria found in the normal crypts of the tonsils of the animals were pathogenic to those animals.

Dr. Davis, replying, stated that Sherman had recently shown that hemolytic streptococci from dogs' tonsils were very similar to those found in the human being. They were virulent for rabbits, but he thought they had not been injected into dogs.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of February 2, 1920.

THE PRESIDENT, DR. ALFRED LEWY, IN THE CHAIR.

Dr. Edwin McGinnis read a paper entitled

"The Intranasal Drainage of the Frontal Sinus and Anterior Ethmoid Cells."*

DISCUSSION.

Dr. George E. Shambaugh complimented Dr. McGinnis on his discussion of an interesting subject. Dr. Shambaugh has for many years advocated the intranasal route as the operation of choice for both acute and chronic cases of frontal sinus disease requiring operation. As a matter of fact, an operation of any sort is rarely necessary in the treatment of acute cases. In those cases where it is apparent that the patient has had recurring acute attacks, it is best to secure better ventilation of the sinus by an operation between such attacks. Occasionally, however, in acute cases no spontaneous drainage can be induced. In such cases the severe pain may make it necessary to operate during the attacks. This, however, is quite unusual. The operation here consists of the resection of the anterior end of the concha media and sometimes, in addition, the exenteration of the anterior ethmoid cells.

In chronic cases the situation is somewhat different. Here an exenteration of at least the anterior ethmoid cells is always required. First, because these cells are usually also involved in the inflammatory process, and second, because the establishing of the necessary ample ventilation of the frontal sinus requires this work on the ethmoid.

In cases where the concha media stands out from the lateral wall sufficiently to permit, it has been his practice to operate on the ethmoid and the frontal sinus without disturbing the turbinated body. This prevents the possibility of injuring the cribriform plate. After the work on the ethmoid and the frontal sinus has been completed one can then decide whether to resect the turbinated body. In many cases the middle turbinated body will be found wedged so tightly between the upper and the outer nasal wall that any work on either the ethmoid or the frontal sinus necessitates the primary resection of this body.

The method of entering the frontal sinus by working from behind forward and upward through the anterior ethmoid cells is, he believed, very much safer than the more direct route going more nearly perpendicularly upward in front of the concha media, as

*See page 631.

advocated by Dr. McGinnis. The danger of forcing a passage into the brain fossa is greater when making the opening straight upward. In the chronic cases he has employed a rasp in securing a larger opening into the sinus. The operation is done under a local anesthesia and in a hospital. No packing is employed unless the bleeding should make one necessary.

Dr. Elmer L. Yenkon said that he had the satisfaction of seeing one of Dr. McGinnis' cases. He thought the work the Doctor had presented was important, and that we should be careful not to lose sight of the main point, namely, if he understood correctly, the effort to operate upon the frontal sinus and ethmoid cells for infection and yet leave them essentially unmutilated. If that was a practical thing to do, if it was possible to accomplish this, it was of great importance. Another thing which Dr. McGinnis had in mind, which was also of importance, was the thought that if one could finally do away with acute infection in this region there was no necessity of thinking of operating upon a chronic condition. The basis of this effort in the future in this field should be largely in the prevention of chronicity. Dr. McGinnis offered the proposition that by nondestructive operative efforts chronicity following acute frontal sinus infection should be avoided, if not always, at least usually. He thought that no one could take exception to this simple procedure in acute cases. He did not say it should always be done in acute cases, but it was a simple procedure which was not destructive and could be held in reserve and resorted to if simpler measures failed. Whether Dr McGinnis was too optimistic in regard to chronic infections he did not know, but was inclined to think he was. This operation called for the development of a smaller type of instrument, since the present instruments were not sufficiently small to handle this relatively delicate region accurately enough. These should be developed by Dr. McGinnis and others working along this line.

With respect to the frontal sinus, the occlusion is not due altogether to the frontonasal duct, but also to occlusion in the infundibulum below the duct. He recently had the experience of caring for a congenitally occluded naris in a girl of nineteen. She had never breathed through one side of the nose. In studying this case he learned that day after day mucus accumulated in the nose and there was no way to get it out. There was no force from behind, no "blow" to the nose, and the patient could only keep wiping the serum away as it slowly oozed out. He could see it collecting in the nose and sticking there; he tried to wipe it away but could not get the naris clean because the secretion was so sticky. The only way he could get it clean was by exhaustion. In the drainage of the frontal sinus a sticky pustular secretion comes down into the region below the frontonasal duct, collecting in the swollen infundibulum and damming up the exit below the duct. The stickiness of the secretion without anything from above to force it out made such cases difficult to drain by gravity alone. Under these conditions, unless the drainage happened to be exceedingly free, it was impossible to take care of the condition effectively, except through some such procedure as this operation, and through exhaustion. In

his opinion, exhaustion was exceedingly important in the care of the nasal accessory sinus infections.

Dr. Charles Long was averse to operating on these conditions in the acute stage. In his experience most of them got well and before he did any operating he always had a radiograph made, and if he did not find infected cells or cells containing pus, in other words, no pathology, of course no operative procedure would be indicated. On the other hand, if the X-ray findings exhibited infection and the process seemed acute, mild treatment would be indicated, using simple warm alkalin douches and sprays, etc., allowing nature, if possible, to clear up the process. In case of great pain that could not be controlled by medicine, some simple operation would be advised, such as irrigating an antrum or the infraction of a middle turbinate bone to improve the drainage. The traumatism of operations on the nose in these acute inflammatory processes is no different than in the abdominal cavity; it is a dangerous proposition. A treatment of watchful waiting, in a large percentage of cases, means recovery without any operation. On the other hand, if we have not succeeded we have at our hand the operation, and I think the doctor's technic is very appropriate and can be successsfully applied.

Dr. George E. Shambaugh thought that the question which had come up in the discussion as to the indications for any operations in acute cases was a very important one. It was his belief that an operation of any sort was rarely indicated during an acute sinus infection. The only indication which he recognized which justified such a procedure was where the persistence of severe pain and the failure to secure any drainage into the nose made it necessary to resort to surgical measures. The method to be pursued consisted, first, of the resection of the anterior and of the middle turbinate body. This would suffice for most of the cases. If relief was not obtained—that is, if the drainage from the frontal sinus was not established, an effort should then be made, by breaking down the anterior ethmoid cells, to enter the frontal sinus along the natural route. Where he has not been able to force an opening through the nose, an external operation may be required.

Dr. Edwin McGinnis stated that the idea in leaving the middle turbinate was because it formed a bulwark between the anterior ethmoid cells, the antrum and the posterior group, to keep the infection forward, and also preserved the normal contour of the nose.

In operating, the biting is all done by sight. One could look up and see what he was doing and keep biting until the passageway was opened; in two or three cases he could see right up into the sinus.

He had a good deal of experience in treating acute frontal sinusitis with Dr. Ingals with the operation he devised. The cases treated medically had frightful pain for two or three weeks, and if they could be made well within twenty-four hours, why not do it? He knew of no better way of avoiding the chronicity that Dr. Kenyon mentioned.

Dr. Norval H. Pierce said that there was a danger in operating on acute cases. He had known of seven cases, not in his own ex-

perience, but among his colleagues, where death had ensued from operation on the middle turbinate body in acute infections of the anterior ethmoid cells. He, therefore, felt that only in those acute cases of intractable pain lasting for more than four days, where the drainage was obviously insufficient, should the danger be assumed of opening up the region, and then the operation should be thorough. In the subacute cases this danger seemed less. In cases where there had been previous attacks with intervals between of apparent normality, the danger was not so great; these intervals might last for weeks or months, but where there was a history of previous attacks, so far as he knew, death had not ensued. The cases he referred to invariably were those where the attack was a primary one and where the operation had taken place within the first week. Further, the danger seemed to diminish if some time elapsed between the onset of symptoms and the operation. The danger was decreased markedly if the operation took place a week or more after the onset.

Dr. Norval H. Pierce discussed the subject of

"Laryngofissure for Carcinoma, with Demonstration of Specimen."*

DISCUSSION.

Dr. Joseph Beck was delighted to discuss the excellent presentation of Dr. Pierce and cited a case of carcinoma of the larynx which he had operated a week or ten days ago, as he thought some of the points in connection with it would be of interest to Dr. Pierce, as he presented the question the Doctor wished to have discussed. A man of fifty was brought to him by Dr. Holding of Madison, for removal of a carcinoma of the larynx which was about the size of the specimen exhibited by Dr. Pierce. A small, unilateral tumor, about one-fourth or perhaps one-half inch in length was situated on the left side of the cord with the greater portion going into the ventricle of the larynx. Motion of the larynx and respiration were not interfered with. The man was well nourished and apparently healthy. Dr. Holding had been in the Memorial Hospital in New York for five years, where radium treatment is used, and requested that radium be used in this case. They considered it an excellent case for operation, so compromised by doing both. Dr. Holding presented him with a reprint from Drs. White and Phipp of New York, who had been experimenting on animals as well as on man, in which they reported definite results from the use of radium preoperatively, following the lethal dose of radium for carcinoma. The lethal dose was figured out in hours, and in this case 150 mg. were applied for twelve hours over the greater portion of the larynx. This was done after examination by direct suspension laryngoscopy, a good sized piece of the tumor being removed and immediately submitted to freezing examination as well as cellodin examination. This required two days. Following this the application of radium was made for twelve hours by a radium expert, according to the technic outlined by the New York gentle-

*See page 595.

men. The following day the patient was operated on under local anesthesia. An incision was made through the suprahyoid region down to the sternal notch. The tissues were dissected down to the larynx, where they encountered a high median thyroid. This could not be dissected outward but had to be incised, after making it a bloodless operation. A median incision was made and a tube placed in, because they intended to follow the operation by subsequent radium treatment. There was no particular difficulty about the operation, except that the cartilage was almost osseous, but by means of Jackson's scissors they were able to split the larynx; without lateral incision of the thyroid membrane they exposed the growth completely and excisd with the knife. The cavity was then packed with a strip of gauze, for what reason he did not know, except that he felt that it was well to keep the larynx in the position it was for subsequent radium treatment. The larynx was allowed to approximate somewhat, although not uniting. Just before the operation was finished the patient had a free emesis, an admost projectile vomiting of the noon meal. He had received one-fourth grain of morphin about half an hour before the operation. He returned to his bed feeling quite well; he complained of no pain during the operation, the pulse was fairly regular, and they thought the operation was a success. During the night he had considerable difficulty with secretion; the gauze was causing irritation and the interne removed the packing, which relieved him. There was considerable secretion in the tracheal tube and in the bronchi, and the interne thought it was necessary to remove this irritation by inserting a sterile catheter under sterile conditions.

The following day the patient had a fairly good pulse, but Dr. Beck was not satisfied; he felt that the man was getting more air than he could consume and appeared to be somewhat in shock. In the afternoon the symptoms of shock were so definite and unexplainable that he called in an expert internist to examine the heart and lung. The internist felt that the heart was badly involved and ordered proper medication, but the patient succumbed on the following day.

The speaker did not agree with Dr. Pierce in not resorting to preliminary microscopic examination. He knew quite well how a carcinoma looked, but a definite histologic examination was of some benefit, and by means of the suspension laryngoscopy he believed it was of some advantage.

In regard to the various operations for the cure of carcinoma, such as laryngofissure, hemilaryngectomy, removal of the carcinoma by the indirect method, he thought the best results were obtained from a laryngofissure, using no tube and sewing up the larynx. He had not had many cases, but had had several fatal cases of inoperable carcinoma. He had excised the larynx and part of the esophagus and the glands of the neck, but they all succumbed. The same thing had happened in laryngectomy, even in many cases which he considered excellent, there had been numerous recurrences in most of the cases. Two cases had lived for several years following hemilaryngectomy, but he believed they would have been just as well off with the present technic of laryngofissure.

As to the question of radium and X-rays, he thought the previous radiation which was so thoroughly believed in by the men in the East was a question in reference to what Fenger called attention to many years ago, of the production of the higher toxic substances or toxin. These substances develop from decomposition, and he wondered whether the case he cited had not succumbed to some such thing producing the cardiac complication.

Dr. J. Holinger considered the presentation of Dr. Pierce very apropos. Last fall he had an opportunity of performing a laryngofissure on a patient after a diagnosis of carcinoma of the vocal cords was made from the local findings and from microscopic examination of a piece of the tumor. General anesthesia was impossible, because the patient had considerable albumin in his urine and his heart was not in good condition. On the other hand, he was a very common-sense, docile patient, and it was decided to work under local anesthesia. The patient stood the operation well; one-sixth of morphin being given shortly before starting. As soon as the larynx was opened the whole interior was thoroughyy cocainizde and the tumor excised in both directions and from the commissure. The main portion of the tumor was in the median line. With the cocain, adrenalin was used so the bleeding was moderate; no ligatures were necessary. As soon as the growth was removed the larynx was closed by sutures, through the cartilage, and a second row of sutures through the skin. Five days after operation the patient went home and returned two weeks later, when the only abnormality was a small granulating fissure in the middle of the hardly visible scar. He removed the granulation and the patient did well until Christmas, when he had difficulty in breathing. It was found that from the anterior commissure had formed a diaphragm scar to almost the middle of the lumen. This might have been expected, since both to the right and left of the median line tumor masses had to be dissected. Cauterizing by means of trichloracetic acid was tried. This gave relief for a few weeks. The patient returned and a larger part was cut out with a double curette. Dr. Boot had tried to do this under direct laryngoscopy, but was unsuccessful, and Dr. Holinger had to resort to the indirect method. The patient did well, and five months after the operation had gained fourteen pounds. He is a farmer, works out of doors, and has to go a little bit slow, owing to shortness of breath. His chief complaint is that he cannot talk well and cannot smoke.

Dr. Otto J. Stein thought the interesting feature of any operation on the larynx was in those cases that had been operated sufficiently long to judge of the ultimate results. He recalled two cases which he had presented before the society six or seven years ago; one was a man of fifty-four or five and the other was fifty-one. They had both been operated under local anesthesia, and both had been done by injecting the superior laryngeal nerves for anesthesia, preceded by scopalamin and morphin, one-one hundred sixtieth grain, and one-sixth grain each. Infiltration of the soft parts for primary incision down to the thyroid cartilage, the immediate introduction of the tracheotomy tube, and the laryngofissure were performed. There was no particular discomfort and very little

bleeding. The cricoid cartilage was preserved in both these cases, although he had cut it in previous cases. The man, aged fifty-one, was accustomed to a good deal of public speaking and had a growth which occupied the anterior half of the right vocal cord, which projected underneath the cord, passed over the commissure to the other side and involved the other cord just at the commissure. In other words, cutting the thyroid cartilage in the median line would cut right through a mass about the size of the end of a finger. This tissue was immediately dissected free and excised with a knife and scissors. Then a considerable portion of the soft tissues above and below were elevated in order to secure a sufficient flap to cover the defect. This he closed in very nicely with catgut. The wound externally was closed primarily, the cartilage not sutured but held in position by the layer suture of muscle, fascia and skin. In previous work he had attempted to sew the cricoid cartilage and found it very difficult, as the sutures pulled through the cartilage or he had to bore through in case of osseous tissue. No packing was used; the tracheotomy tube was left in until the following day and then removed. Both cases were presented two weeks after operation and both were living at present. One of the patients whose case he cited was mayor of his town, had gone through a second campaign and did a good deal of talking. Both cases were of considerable interest because they were both operated under local anesthesia and both did well.

Regarding preliminary diagnosis by removal of tissue for confirmation of the diagnosis, he always did this, probably because of the training he had received. It was very difficult to convince a patient and his relatives of the necessity of what they considered a serious operation without something more confirmatory of the diagnosis than the macroscopic, and he thought best to follow the procedure of preliminary endoscopic removal of tissue to satisfy them. He had never had any difficulty in getting the patients to submit to the operation as outlined after this confirmation. The preliminary removal of tissue had always been done by the indirect method until recently, when he had been using the suspension laryngoscopy, which he thought was far superior to the indirect method.

He had always felt very strongly that laryngofissure was the method for removal of fairly well localized tumors of this character within the larynx, provided they were not complicated by any glandular involvement.

He had never used packing, and thought the local anesthesia had many advantages over the general. He would hesitate to use general anesthesia for this kind of surgery, for it could be done so easily and satisfactorily, with all the advantage of having the patient awake and expelling the secretion that might get into the lungs.

Replying to a question from Dr. Pierce, he stated that he dissected the mucous membrane free above and below and in every direction possible, thus mobilizing the flaps sufficiently to bring them together and cover the defect, where they were sutured with catgut. In a large defect this could not be done, but in his two cases it worked very well.

Dr. Harry L. Pollock thought some of the questions had been answered by the essayist himself. In the cases of small, localized carcinoma he was sure the tracheotomy was not necessary, because he knew how much work could be done within the larynx without any resulting trouble. They had tried it in the cases they had, and one case which Dr. Beck did not mention, a case of this kind with a small carcinoma on one cord which they saw about nine years ago and in which they did a laryngofissure and sewed it up immediately without any tracheotomy tube. In that case there was no difficulty except some slight trouble in swallowing for two days, after which the patient swallowed food. The man was an insurance agent and with the exception of slight hoarseness was as good as ever. In the cases with difficulty in breathing, if they were cyanotic, it was necessary to do a preliminary tracheotomy before even a microscopic examination could be made, and in these cases they did not attempt a laryngofissure, except in some cases in which they used the cautery and left the laryngofissure open. In the small localized growths of one cord he felt that they could be removed very nicely by laryngofissure without preliminary tracheotomy. Very little packing was necessary, because they got along very much better if sewed up at once. It had never, in his experience, been necessary ot do a tracheotomy afterward, as there was no trouble in breathing.

In a case which was diagnosed as carcinoma in a man of sixty, he did a direct laryngoscopy and removed a portion of the growth expecting to get carcinoma, but found nothing but connective tissue and round cell infiltration. He thought he had not gone deep enough in the larynx, so suspended the patient again and went in deeper, but found no sign of malignancy, but did a laryngofissure and removed the growth anyway. He did a preliminary Wassermann test, for the man had been hoarse for several months. He made a flap and got down to the thyroid cartilage and saw a tumor about the size of a hazelnut projecting. He was going to dissect it out, and just as he cut into the membrane a flow of pus began; so he dissected this growth out and put in a drain. Examination showed this tissue to be of the same nonmalignant character. The man had a cellulitis, but made a good recovery and his voice is in good condition and his larynx is absolutely normal. He thought this condition was a perichondritis followed by an abscess.

He thought the experience of most men had been that in the small localized carcinomata it was well not to do a preliminary tracheotomy, not to use packing, and to sew up immediately. He had not seen any pronounced benefit from radium therapy. Even when the cautery was used it was possible to sew up the wound, as there was so little edema following the operation.

Dr. Pierce (closing) said that the cases of carcinoma of the commissure were of special importanc but, as was well known, they were likely to result in webs and scars. Dr. Stein had been very fortunate to be able to make flaps from the anterior portion of the mucosa to cover the defects. It was possible to get material from the posterior mucosa to cover up the defects, but it was rather more difficult to stretch the mucosa of the anterior portion of the larynx. However, even this danger should not preclude the perform-

ance of the laryngofissure, because the web or scar was very much more readily dealt with and the patient was in much better condition than if total extirpation was performed.

He realized that his view regarding the preliminary microscopic examination for confirmation of the mirror diagnosis was rather iconoclastic. However, Dr. Pollock substantiated his view. In the case he cited where he was not sure of the diagnosis, where the diagnosis was against carcinoma, yet he did the laryngofissure. The point was that one could not depend upon indirect laryngoscopy for removal of tissue for microscopic examination. He thought practically all laryngologists believed this. In his opinion, there was no doubt that direct laryngoscopy was one of the best methods of doing this. But with a tumor in the larynx, with syphilis excluded, with tuberculosis excluded, the probabilities are that it is carcinoma of the larynx, so why not make the diagnosis at the time of operation without subjecting the patient to all the other more or less demoralizing and depressing experiences? He reserved the right to modify his views at any time, and thanked the members for their attention and for answering his questions so thoroughly.

NEW YORK OTOLOGICAL SOCIETY.

Meeting of January 27, 1920.

Case of Purulent Meningitis and Labyrinthitis Operation—Recovery with Hearing.

Dr. Edmund Prince Fowler: Annie G., age 11 years. Family history negative. Past history: Pertussis and nephritis as a baby. Attended Sea View, Ruptured and Crippled and Staten Island hospitals for cervical Pötts' disease and wore brace for three or four years. Since infancy has had a purulent ear discharge, off and on, usually in the winter, but for the past two years both summer and winter, with intermissions. Pain unusually severe just before the renewal of the discharge. No headaches, vertigo or tinnitus until present illness.

Present history: On Nov. 24th, one month before I saw her, she awoke about midnight with severe headache all over the head, but especially in the left ear. Legs so stiff that she could not move them at the knees. Fingers clenched, and hands opened with difficulty. No chills or sweats recalled.

Vomiting violent and vertigo, with sensation of turning to the left—i. e., toward the diseased ear. The room appeared to be turning about her to the right.

Spinal puncture by the Board of Health four times. No organisms but a great increase in cells found. Fluid was hazy to purulent. Polys were 90 per cent to 50 per cent; monos, 50 per cent at first tap; albumen, double plus; globulin, double plus. They will not commit themselves on diagnosis, but were looking for epidemic meningitis.

Enduring one week, all of the aforesaid symptoms subsided gradually, so that the patient resumed her attendance at school for two days, feeling quite well until the evening of the second day when there occurred increasingly severe headaches and sudden projectile vomiting, preceded and accompanied by violent vertigo. This lasted with diminishing intensity for five days.

The slightest head movement would cause it to recur. Closing the eyes did not diminish the vertigo but did lessen the severe headache.

The vertigo was now opposite to that of the prior attack—i. e., she felt as though her body was turning to the right and the room to the left (is very positive as to the direction of the vertigo in this and in the previous attack).

Vomiting always occurred with any exacerbation of the vertigo and with the latter diminished. (I believe it was at this time that the left static labyrinth ceased to functionate.)

On Christmas day the patient got out of bed, but that night vertigo and vomiting again recurred so that she again took to her bed. Two days subsequently she was admitted through Dr. Phillips' clinic to the Manhattan Eye, Ear and Throat Hospital. On admission the patient was so sick that but few hearing or other

tests could be made. The tissues over the left mastoid were slightly edematous, the tip was tender on pressure. Discharge profuse, thick and foul. Claimed to hear nothing in left ear. Right ear normal. Vertex forks referred to right (good) ear. No spontaneous nystagmus. Knee jerks absent (may be due to stiffness of knees). Neck very stiff, more so, she thinks, than in former attacks. Kernig positive and the most marked I have ever seen. Babinsky indefinite. Fingers stiff and clenched on palms. Temperature, 102 to 104; pulse, 104; respirations, 24.

Laboratory findings by Dr. Dwyer: Eye fundi: right normal, left little hazy. Ear pus culture shows mixed forms. Blood: leucocytes, 9,800; large monos., 5 per cent; small monos., 21 per cent; total, 26 per cent; polynuclear neutrophiles, 74 per cent; albumen, fairly heavy trace; lactic acid, present; sugar, absent; acetone, absent. Smears showed no organisms but numerous leucocytes. No organisms after 36 hours' tucubation. Urine negative.

The child looked like she was going to die, and until learning the results of Dr. Dwyer's cultures I was determined not to add to her suffering by an operation which appeared hopeless.

Radical mastoid operation was done on December 30, 1919, under gas and ether anesthesia. Pus and necrosis found especially about tip and in and near antrum and posterior wall. The middle ear and antrum were filled with cholesteatoma. Facial nerve was exposed over knee and forward, for about three-eighths to one-half of an inch, and the black necrotic bone about it removed, disclosing the remains of the eternal semicircular canal. This was also removed. No fluid contents of the canal was noted until the vestibule was nearly reached, by way of the ampulla, when seropurulent fluid exuded therefrom.

Dura of middle fossa exposed and regarded as normal. No facial twitchings or eye movements noticeable during or following the operation. A partial facial paralysis appeared at the end of 24 to 36 hours. This has practically cleared up.

The question was now should I stop, having obtained drainage through the small opening into the vestibule, made as described above, or should the labyrinth be uncapped through the promontory or opened further by way of the solid angle?

Having with but the trauma of curetting provided drainage and being fortified by the opinion of Dr. Dwyer, who saw the operation at this critical stage, I stopped. No flap was made or sutures inserted. Wound was flushed with hot saline and with alcohol, and iodoform packing inserted. Time of operation, about forty to forty-five minutes.

After postoperative shock patient steadily improved, stiff neck and Kernig gradually disappeared and within ten days everything was down to normal with the child walking about the ward.

On January 2, 1920, C^1 fork was referred to right side. Right cornea showed rough patch one-fourth inch square at eternal lower pupillary margin. No history of prior eye trouble. No Rhomberg, Argyll-Robertson or unbalance phenomena.

On January 10, 1920, vertex forks were referred to right ear except C^2, which was referred to the left (bad) ear.

Ten rotations to the right in 20 seconds gave no nystagmus, no sense of turning. Ten rotations to the left in 20 seconds gave 12 seconds of nystagmus, on the fifth turn and on stopping for a moment.

Ten rotations to the right gave nystagmus on the fifth turn.

On January 13th, right 10 in 20 seconds gave nystagmus.

Past pointing after rotation to the right was nil. Past pointing after rotation to the left was present for an instant only.

On January 21st, results were as above, but sensed turning to the right after six or seven turns.

Hearing: Right normal, left hears whistle, loud voice and even words with Barany noise apparatus in good ear. Does not hear 16 or 32 D. V. forks in her left ear by bone or air. All other forks are now referred to bad ear.

X-ray and Wassermann negative.

She states that her hearing is now better than for past two years. What lesson, if any, may we learn from this most unusual case? I myself feel that the child is alive and apparently well today because I did not open further the labyrinthine spaces.

In the discussion of this case of Dr. Fowler's several points of interest were raised: (1) concerning the character of the meningitis, whether or not it was of otitic origin, no organism having been found.

Dr. Wendell Phillips said, considering the salient features as stated by Dr. Fowler, he did not think it had been made quite clear that this was a case of meningitis of otitic origin.

Dr. P. D. Kerrison called attention to the observations made by Dr. Neal and Dr. DuBois, that it is quite possible for a meningitis coincident with an otitic lesion to be of the epidemic or meningococcic type and that in such cases as this, where the organism was not discovered, they advocated the early use of antimeningococcic serum.

Dr. J. W. Dwyer said he wished to emphasize several features of importance. This case was one of otitis meningitis through the labyrinth, and the important thing was that a complete labyrinthectomy was not done as is usually done in such cases. This case would not, in his opinion, be a guide for other cases, but it was well to place it on record, as undoubtedly the conservative operative measures here contributed to the happy outcome. The idea at the time of operation was not that of doing a labyrinthectomy but to get drainage, and when Dr. Fowler found the open semicircular canal, with the semipurulent fluid coming out, on being appealed to by Dr. Fowler, he advised no further opening of the labyrinth, as sufficient drainage was apparently established. He wished to say, further, that usually we assumed that we knew all about the labyrinth, that there was a set rule by which we ought to operate on every case, regardless of the findings. This idea the speaker wished to get away from. Our knowledge of the labyrinth is comparatively recent, and all such cases as the case in question should be placed on record.

Dr. Dwyer, in answer to Dr. Kerrison, thought the latter had misinterpreted the results of Drs. DuBois and Neal. The demonstration of the organism in spinal fluid is not always possible,

even when present in large numbers, on account of certain well recognized mechanic and biologic facts pertaining to organisms in a closed cavity in contact with such a body as the cerebrospinal fluid. This was well recognized in practice by bacteriologists or serologists for the last few years.

Dr. Fowler, in answer to Dr. Berens' question concerning the character of the fluid that escaped from the vestibule, said that it was noticeably abnormal, turbid or seropurulent, but not markedly purulent.

Dr. T. P. Berens suggested that the inflammation in the labyrinth might have been confined to the region of the disclosed semicircular canal and the meningitis developed through connections other than through the labyrinth itself.

Dr. I. Friesner recalled a case operated upon in which the disease was limited to the external semicircuar canal and hearing present. (2) Owing to the child's condition, no complete functional tests could be made, and the point whether a diffuse labyrinthitis was present was brought up.

Dr. Fowler stated that at the time of operation he thought the labyrinth had been destroyed by the previous attack of vestibular disturbance and that the hearing that existed afterwards was a surprise to him.

Dr. Rae raised the point as to whether there ever had been in this case a diffuse involvement of the labyrinth. It was unfortunate, although unavoidable, that the condition of the patient on admission did not admit of an examination of the hearing. So far as the history goes, the symptoms preceding admission are distinctly referable to the vestibular apparâtus, and it is not uncommon to find these in a case of chronic purulent otitis media. The partial restoration of hearing following recovery would make the conclusion almost inevitable that diffuse labyrinthitis had not previously existed, or that if it had, it must have been serous only in character. (3) Whether the limite doperative interference performed in this case was justified and should be considered as a guide for future operations was a question which gave rise to considerable discussion.

Drs. Phillips, Dwyer and Fowler were of the opinion that sufficient drainage was established through the opening at the ampulla and that further interference with the rest of the labyrinth would have increased the risk and made recovery less probable. In opposition to this view Dr. Kerrison recalled a case in which he had found a diseased condition apparently limited to the external semicircular canal, but on uncapping the promontory as an additional prcaution for drainage, he found pus beneath it which would have been confined in a dangerous locality had he been satisfied with the removal of the canal alone.

Dr. A. B. Duel said that in a case of meningitis in which disease of the external semicircular canal was found, as in the present case, he did not think it advisable to stop with the removal of that canal alone, and that under such circumstances the possibility of there being hearing present was not to be considered.

Dr. Thos. J. Harris agreed with Dr. Duel and thought it should go on record that in this case of meningitis in which such exten-

sive disease of the semicircular canal was found, the proper procedure would have been to establish drainage through a more complete exenteration of the labyrinth, that the possibility of saving the function of the labyrinth should not be considered when the life of the patient depended upon the greatest possible drainage through a more radical operation.

Dr. Fowler concluded by saying that he agreed with the principles stated by Dr. Harris, but in the case under consideration he felt he had established sufficient drainage, and in this opinion he was supported by Dr. Dwyer, who was present at the operation and by the fact that the patient got well.

Deafness Following Injury.

Dr. Thos. J. Harris then presented a patient, a girl, 11 years old, the history briefly being that she attended the public school near home as a normal child in every respect so far as her hearing was concerned, up to a certain day last June. Last June she went to school and because of some displeasure on the part of the teacher she was taken to task and shaken, but there was no amount of force used. However, with the little shaking that the teacher gave her, her head struck the blackboard and she went back to the desk. There was no bruise or fright, but she arrived home to her mother and brother in a deafened condition. She has been in the same condition ever since. The history apart from this is that there was no deafness in the family. The older brother never had any ear trouble. The child gave no indication of deafness, nor is there any indication of nystagmus, vertigo or noise in the ear. The child was taken to the Manhattan Hospital some time during the early fall—in September—and was seen by some of the men on Dr. Phillips' staff, and there a Wassermann was taken. The report for the Wassermann was negaitve. The child is extremely intelligent but rather nervous. The nose and throat are normal. With Barany noise produced in the right ear she is totally deaf in the left ear. There is, however, some hearing in the right ear. No eamination has been made of her eyes. Dr. Harris stated that he had questioned the mother and brother, also Miss Gregory, who is one of the representatives from the public schools. He said that she could read lips if she were not so nervous. The interesting question is, what has taken place in this case—a double hemorrhage, or is this one of those cases of a psychical nature? It seems incredible that this slight traumatism should have produced this result. There is a straight history from the mother and no history of sickness. The child was perfectly well with it all and went to school, but has no hearing in the left ear and very little in the right one. Dr. Harris stated that this little girl had been sent to the Wright School and that Miss Gregory would be glad to supplement any information on the history.

DISCUSSION.

Dr. Scruton suggested that it would be interesting if the child were made to speak, in order to hear the tone of her voice; that her degree of deafness might be judged somewhat from the tone of her voice. The teacher who was with the little girl got her to

answer a few questions, and it was noticed by several members present that the child answered these questions when her eyes were directed away from the teacher, so that, in their opinion, the child hard the sound of her voice and did not read her lips.

Dr. Rae ventured the suggestion that the hysterical element should be considered in this case and that the Lombard test might be of great value.

In all these cases three elements were of importance: (1) an unstable nervous make-up; (2) the immediate suggestion of impairment of the hearing, sometimes real. This constitutes "auto suggestion"; (3) the added suggestion of continued impairment of hearing by the line of treatment and by association with those really deaf. This is the socalled "heterosuggestion."

The absolute diagnosis should be made as soon as possible. Should the case prove to be hysterical, it is quite likely that the patient will fare better by the cooperating of the otologist with the psychiatrist.

Dr. Rae showed a

Specimen of an Internal Jugular Vein

from a neglected case of sinus thrombosis, presenting several metastatic joints at the time of operation. The vein wall above the junction of the facial was completely eroded and the upper end was lying free in an abscess cavity. A small clot in the upper end was all that prevented hemorrhage into this abscess cavity. The facial vein was very much enlarged and carried blood.

Dr. A. B. Duel reported a case of

Mastoiditis Following Measles

on which he had operated, which ran a high temperature, a high leucocyte count, a high polynuclear percentage and a positive blood culture of streptococcus hemolyticus, which gradually subsided and was apparently going on to uneventful recovery without any further operative intervention, it being then two weeks after the operation.

Dec. 29, 1919. Temperature, 103 to 104½. Measles.

Dec. 31. Myringotomy; left ear culture and smear taken.

Report: Pus and superficial epithelial cells with no apparent bacteria. Free drainage from left ear. Temperature ranging from 103 to 101.

Jan. 2, 1920. Temperature dropped to 100.

Jan. 4. Myringotomy, right ar. Swab culture and smear taken.

Report: Culture showed a growth of a streptococcus which developed no pigment or hemolysis and a staphylococcus aureus and nonpathogenic organisms.

No rise in temperature until Jan. 7, 1920. Temperature, 103, 102.

Blood count, Jan. 9, 1920, W. B. C., 12,000; P. 74.5 per cent.

Blood count, Jan. 10, W. B. C., 10,200; P., 75.0 per cent.

Blood count, Jan. 11, W. B. C., 10,500; P., 74.5 per cent.

Blood count, Jan. 12, W. B. C., 12,900; P., 67.0 per cent; L., 33.

Jan. 12. Operation right mastoid. Culture taken at operation.

Report: Culture showed a growth of a streptococcus which developed no pigment or hemolysis and nonpathogenic organisms.

Postoperative temperature, midnight, Jan. 13, 99; 2 a. m., 98.6; 9 a. m., 104.8; 12 noon, 101.8; 4 p. m., 103.8.

Blood count and culture taken. White blood count, 36,500; P., 91. Culture hemolytic streuptococci, 1 flask.

Jan. 14. Temperature not over 102 and after that a gradual drop.

Jan. 14. White blood count, 29,600; P., 91; L., 9, at 9 a. m.; white blood count, 25,400; P., 88; L., 11.5, at 6 p. m.

Jan. 15. White blood count, 17,600; P., 88; L., 10. Blood culture negative.

Jan. 16. White blood count 9,400; P., 73; L., 27.

Dr. Dwyer thought that in this case Dr. Duel had the beginning of a lateral sinus thrombosis in which there was a tremendous outpouring of leucocytes to combat the localized inflammation of the sinus, but that if it later became walled off it might remain permanently walled off and become organized, or it might later on disintegrate and cause trouble.

Dr. Duel replied that he had understood from Dr. Dwyer that cases of sinus thrombosis rarely ran such a high leucocyte count; that with this leucocyte count a beginning pneumonia or meningitis might rather be expected.

Reference was then made by Dr. Dwyer and Dr. Scruton to the routine practice of taking blood cultures before and after mastoid operations, as carried out some years ago at the Manhattan Hospital after similar investigations had been performed at Mt. Sinai and to the difference in the conclusions reached by Dr. Libman of Mt. Sinai, who maintained that a positive blood culture in such cases invariably meant a sinus thrombosis, and Dr. Duel and Dr. Wright of the Manhattan, who found, on the contrary, that a considerable percentage of such cases had positive blood cultures without ever developing sinus thrombosis.

Dr. P. D. Kerrison reported a rapidly fatal case of

Cerebellar Abscess,

apparently complicating acute mastoiditis. The patient, a girl of 14 years, was admitted to the ear ward of the Manhattan Eye and Ear Hospital, November 8, 1919. The history obtained from herself and family was of an acute purulent otitis media of the right ear of ten days' or two weeks' duration. On the day of admission, November 8th, the drum membrane was intact but somewhat red and infiltrated. Appearance of drum membrane is described as suggesting an acute lesion which was undergoing resolution. Temperature was 98.4. No pain or tenderness. Mind perfectly clear. X-ray ordered.

On November 10th (time of Dr. Kerrison's first examination). Drum membrane had been incised the day before. Temperature, 98.6; pulse, 63. At this time the following symptoms were present: Nystagmus, changing in direction, but most active to right when eyes were turned in that direction; incoordination ataxia of right hand; diadokokinesis with slow movements of right hand. Past pointing to right with right hand; left hand retaining normal pointing accuracy. On standing with eyes closed there was a clear and constant tendency to fall to the right. Eye grounds normal. X-ray showed cloudiness in region of right antrum.

A diagnosis of cerebellar lesion was made, but on account of the very recent onset, only a mastoidectomy was done at this time. The mastoid was of diploic type, with evidences of only moderately extensive disease.

During the days following the operation the focal symptoms of cerebellar abscess were so definite as to make the diagnosis practically positive. These symptoms were good hearing in both ears; nystagmus to right; falling to right; past pointing of right hand to right, left pointing normally; incoordination ataxia; diadokokinesis (right). Reflexes normal but less active on right side. During these days, but for these focal symptoms, the patient's general condition was better—i. e., she complained only occasionally of moderate headache; her mentality was perfectly clear; and what is exceedingly unusual in such cases she did not seem to suffer particularly from insomnia even at night.

Owing to her history of a very recent onset and her very favorable general condition, it was decided to wait until the following Monday, one week from the day of the mastoid operation, to explore the cerebellum. It was thought the additional time would increase the chances of finding the abscess without undue multiplication of incisions. This was a decision which, Dr. Kerrison said, he thought of now with very great regret, for the patient died unexpectedly on Friday night.

An autopsy was refused, but Dr. Kerrison took occasion to remove a little bone behind the sinus, where introduction of a knife revealed the presence of an abscess.

NEW YORK OTOLOGICAL SOCIETY.

Meeting of March 23, 1920.

Paralysis of the External Rectus Following a Thrombosis of the Sinus at the Bulb.

Dr. John R. Page: I reported a case of paralysis of the external rectus following a thrombosis of the sinus at the bulb. The wall of the sigmoid area was thin and normal in appearance. The woman had a leucopenia and it was thought possible that she had typhoid. After waiting several days it was decided to explore the sinus, to determine the cause of the high temperature and septic appearance. When this was done there was little or no bleeding from below. The jugular was then excised and the temperature subsided. The day after the operation a paralysis of the external rectus appeared and a metastastes in the wrist. She went on to uneventful recovery and the metastases cleared up. I considered the paralysis of the external rectus to be due to the close relation of the sixth nerve to the inferior petrosal sinus. A similar case was seen in a young man who, after a mastoid operation, ran a temperature of 103 or 104 and developed a paralysis of the external rectus on the side of the operation, about a week later. This occurred shortly after the case just mentioned, and I felt that the paralysis might be significant of trouble in the jugular bulb and as the temperature remained between 103 and 104, though without any typical remissions, I decided to explore the sinus. In doing so I found no bleeding from below, so the jugular was resected with a satisfactory result.

Dr. Bowers: When the paralysis appeared I explored all parts. I exposed the sinus to a point behind the knee, but the sinus was normal in appearance. I apparently could plug it off at both ends. There seemed to be blood coming from below. The temperature was never above 102. The patient did not appear very sick and had no headache. I exposed the dura in the middle and posterior fossa and found them normal.

Dr. Page: In both of my cases the sinus had the appearance of a normal vein. The wall was not inflamed in the mastoid region. While there was a flow of blood from below, there was not the usual gush present.

Dr. J. G. Dwyer: About seven years ago I wrote about three causes of external rectus paralysis: (1) Basilar meningitis; (2) simple mastoid—most of them have relation to the petrosal sinus of the sixth nerve; (3) intraspinal syphilis.

Dr. F. B. Dench: I operated upon a young girl on the fifth day of an acute mastoiditis of the hemorrhagic type; the wound suppurated, broke down and refused to heal. Five weeks after operation there was an external rectus paralysis and severe headache over the area of the trigeminal nerve. I thought it might probably be hysterical. A neurologic examination showed paralysis of the sixth nerve with nothing to account for the pain. I thought

we had adhesions about the Gasserian ganglion and explored the apex of the petrous pyramid, stripping the dura about the Gasserian ganglion. The patient made a perfect recovery. I believe that there were adhesions involving the Gasserian ganglion which accounted for the pain.

Dr. Kerrison: I have operated upon only one case of abducens paralysis. I looked up the literature at the time and found many cases reported in which a sixth nerve paralysis complicating mastoiditis quickly disappeared after mastoidectomy. My case was that of a girl of eight years, who was under Dr. Jno. M. Wheeler's care for her eye condition. Her chief discomfort was diplopia. She suffered from a right sided mastoiditis, and trying to rotate her eyes to the right—e. g., to follow one's finger moved to the right—the left eye moved normally in that direction, the right eye stopping in the median position.

The operation was a simple mastoidectomy except that the sigmoid sinus, the dura covering the cerebellum in front of the sinus, and the dura over the tegmen antri were uncovered, but no evidence of disease was found in these regions.

On the day following the operation the function of the right rectus was much improved. On the second day, Dr. Harmon Smith, who was interested in the case, examined the patient with me, and we could find no sign of paralysis.

In the literature there are many reports of quick recoveries after operation. There are also many theories as to the method of nerve involvement—e. g., through necrosis of the apex petrous bone (Gradenigo); pressure on nerve during cavernous sinus thrombosis; spread of infection along the floor of the midcranial fossa; direct infection through suppurative labyrinthitis. These various hypotheses, while theoretically sound, do not aid us much in dealing with a given case. We do know, however, that many cases of sixth nerve paralysis complicating mastoiditis have recovered more or less promptly after careful mastoidectomy.

Dr. Harris: I saw a case which developed a very pronounced paralysis after operation. It was relieved by an ordinary sinus thrombosis operation. We never recognized any bulb condition. There was no rise and fall of temperature. What significance are we going to attach to paralysis after mastoid operation?

Dr. Kerrison: There may be three causes: (1) Meningitis over the tegmen; (2) Gradenigo's symptom, or paralysis due to inflammation involving the petrous bone; (3) paralysis secondary to sinus thrombosis.

Dr. E. B. Dench: It seems to me that when we consider the anatomy of the sixth nerve it is more or less exposed in cranial cavity, therefore any inflammation in the cranial cavity may involve the nerve.

Dr. Haskin: Does the sixth nerve pass out of the posterior lacerated foramen?

Dr. Dench: No; from the anterior lacerated foramen, and hence any inflammation of the cerebral membranes from the posterior lacerated foramen to the anterior lacerated foramen may interfere with the function of this nerve.

Dr. Duell: A perineuritis comes into very close proximity with the inflammatory condition.

Dr. Bowers (closing): I did not make a diagnosis of encephalitis. The neurologist made that. I said that if the paralysis had occurred on the other side I would have believed him. There were no other indications for operative interference that I could see.

Three Unusual Cases

Dr. J. D. Dwyer: : I performed a simple mastoid operation on a woman in February, and after the operation she ran a perfectly normal temperature until the eighth day, when there was a sudden rise to 106°, which kept up for four days. The first blood count was 17,000 with 78 per cent polys, leucocytes 56, then 96 per cent polys. It was negative for meningitis. The temperature fell on the fourth day, but even with normal temperature the blood count was 45,000. There was a chest condition showing rales. Another case, a woman operated on for mastoid disease, nearly died on the table. Acetone and diacetic acid were present. I found the sinus exposed and the wall eaten through and lying on the sinus wall eight or ten small coagulated blood vessels at the knee. I tied off the jugular and the patient made an uneventful recovery. An hour after the operation there was no acetone. Of course, this was a heroic measure. The third case was a woman. The history showed that when she was in bathing she felt a sudden pain in the ear. Later there was a little discharge from the ear. She consulted her doctor. He said there was a little wet wax. The smell indicated bone disease. There was a small bleb with granulation tissue and a fistula in the posterior wall, two or three mm. from the drum. The middle ear was perfectly normal; labyrinth was normal; Weber normal. The fistula is under the facial nerve. The question is whether to do a mastoid operation.

Dr. Haskin: In the second case the woman had irritation of the third nerve.

Dr. Rae: This raises up the question of cholesteatoma.

Dr. Dench: There is no question at all but that a cholesteatoma should be operated upon.

Dr. Friesner: The question in this case was whether there should be a radical mastoid or not.

Dr. Haskin: Was there involvement of the facial nerve, about 2 mm. from the drum, near the floor, not near the attic?

Dr. Berens: Should one leave a cholesteatoma in? No; one could keep away from the nerve, or even by dissecting out the nerve one would not necessarily get a paralysis.

Dr. Scruton: I would like to ask Dr. Dwyer what the X-ray indicated? Did it show that there was cholesteatoma present? I don't know how one would diagnose a case of cholesteatoma by the X-ray. I have seen a few cases of that type. These cases seem to be a low grade condition, lying dormant for a long time and not recognized. The diagnosis is furunculosis. That teatlike formation is not a furuncle. One should do a simple mastoidectomy and be guided by the findings.

Dr. Dench: Dr. Richards operated on an acute case where the functional tests were normal and hearing perfect. The man had

had two operations. If there is a cholesteatoma in the middle ear the mastoid and middle ear may be thrown into one cavity and a complete mastoid performed, taking out the ossicles. A cholesteatoma does not clear up after a simple mastoid. Any modification of the mastoid might sometimes be successful, sometimes not. The external auditory canal and the meatus must be joined together. I do not think the normal hearing tests mean much. I think unless a radical mastoid is performed for cholesteatoma, recurrence is likely.

Dr. Haskin: Has Dr. Dench had any experience in determining cholesteatoma by the X-ray? The X-ray is often not very satisfactory in mastoid work. I have had cases of chronic suppurative ears on one side X-rayed, and have had the report come back that both mastoids were full of pus and granulations, where there was no history of both, but the X-ray man reported both mastoids involved. One is not justified in accepting this diagnosis. In one man, 22 years old, who said he had had discharge on the other side in childhood, the drum and membrane showed old traces, but he said he had never had any trouble since childhood.

Dr. Lewis: I don't think you can read pus and granulations in the X-ray.

Dr. Dench: I did not understand Dr. Haskin's question. In children you do not find infantile type of bone, and also in chronic suppuration. I always see every case X-rayed. I don't remember a single case where I have recognized a cholesteatoma. The infantile type of bone is common in the marked suppuration cases. I have done double operation with infantile bone on one side and sclerotic bone on the other, but that is atypical.

Dr. Scruton: Reading the X-ray is a matter of comparison. Some send in histories to the X-ray man and additional data. Some do not give him any data. The X-ray man should get a concise history and be told what the operative findings are. There should be co-operation in working out the X-ray findings.

Dr. Dench: I should like to take exception to that particular statement.

Dr. Bowers: In one case I had of chronic ear the whole mastoid was full of cholesteatoma. The X-ray showed nothing more than a sclerosed mastoid.

Dr. Friesner: In a cholesteatoma taken from a large cavity the X-ray findings showed the findings distinctly. There was a very thin cortex, just like eggshell. I would like to go back to Dr. Dwyer's case. In the operative treatment of these cases we begged the question. Supposing there was tympanic perforation, the paralysis would be an extension of middle ear condition from the mastoid.

Intracranial Growth.

Dr. Harris: This patient has been under observation seven years. He was presented three years ago. It is a case of intracranial growth. He is an Episcopalian minister, who developed ear symptoms at the age of 20 years, while in the theologic seminary. At first we thought it was a case of middle ear suppuration. In 1913, at St. Luke's Hospital, based upon symptoms pointing to mastoid involvement, we operated but found nothing in the matsoid. The

growth remained away for a short time. The pathologic report at that time was lost, but pointed to sarcoma. Paralysis of the left recurrent laryngeal nerve followed, then involvement of the facial with partial lid drop. The labyrinth was dead with loss of hearing. Further operation was decided against, but radium therapy was instituted. He had several applications of radium with remarkable benefit. Then he developed symptoms of irritation of some of the cranial and spinal nerves by extension of the growth. Two years ago he suffered most severe and almost intolerable pain. This disappeared later. I saw the man two years later. I expected him to die, but he recovered and has been able to do his full complement of work. He now feels better, and examination of the ear and canal showed recession of the growth, which at one time protruded a little from the auditory canal. Dr. Ramsay Hunt has recently made a careful neurologic examination. He concludes that the growth seemed to have made little progress and that the man was in excellent condition. A blood Wassermann was negative.

Dr. Dench: Was there any reaction of the eighth nerve?

Dr. Harris: None.

Dr. Saunders: What about the spinal fluid Wassermann? Was that negative?

Dr. Dench: It would seem advisable to make a Wassermann test of the cerebrospinal fluid and to try salvarsan.

Mastoid Disease Determined by Radiogram.

Dr. Macpherson: I hesitated before deciding to report this case, as, apart from one or two features, it is commonplace, but in view of the remarks relative to radiographic plate values, the case and the accompanying plates may be interesting.

I first saw the case on February 22nd, when he stated that he was suffering from right frontal headache, which had been present for a week. His nose had been operated upon on January 26th, following which he had pain in both ears. He was treated by inflation, but not improved. He had right sided nasal discharge for a week following January 26th. No abnormal discharge was found on or after February 22nd, but right frontal headache was intense and prevented sleep.

Examination shows right drum to be pearly pink, and slightly bulging outward. On touching with cotton or a probe, it rustles like paper. An X-ray picture, taken ten days ago at the Eye and Ear Infirmary, was negative. There was no evidence of accessory sinus disease found March 1st. Temperature taken t. i. d. from the 24th of February to the time of operation showed no rise above normal.

Radiographic finding show absence of both frontal sinuses, and the other accessory nasal sinuses appear to be normal. Hence, the frontals are positively excluded as a cause of the persistent headache.

The right mastoid was reported as filled by granulations or pus with evidence of beginning softening.

Operation was advised, but the pain suddenly disappeared, and the patient and friends hesitated until, on March 13th, the patient

experiencing a mild attack of vertigo, we were permitted to operate upon the mastoid on the 14th. The mastoid cells were pretty thoroughly destroyed, and a perisinus abscess was present. The knee of the sinus was pitted, and it was felt that there was a likelihood of partial collapse from a thrombus. However, it was decided to await developments before exploring the sinus. The aditus ad antrum was very small and contained granulations, which may have played a part, together with granulations in the middle ear, in causing the drum to present the appearance described.

The patient recovered without any later sinus symptoms. The interesting features were the frontal pain with the history of early nasal discharge, which caused some confusion until the radiograph was taken; the cause of the frontal pain; absence of a rise of temperature for the period of three weeks; absence of pain on deep pressure during the period of a month; the evidence of middle ear involvement, peculiarly indicated by the appearance of the drum; the aid given by the radiograph.

Dr. Haskin: Did you say there was profuse discharge from the nose? Was there a lumbar puncture done?

Dr. Macpherson: Yes, the discharge was profuse for a week following the nasal operation. There was no lumbar puncture made.

Dr. Friesner: Was there any rise of temperature?

Dr. Macpherson: No.

Dr. Haskin: Was there any tuberculous history?

Dr. Macpherson: I think there was, but am not positive.

Dr. Haskin: Did you try the tuberculin test?

Dr. Macpherson: No, the boy was 18 years old, and the case acute.

Dr. Haskin: In spite of that, you often get valuable information from the tuberculin test, even in grown people.

Streptococcus Capsulatus Mastoid Involvement.

Dr. Saunders: This is a case of streptococcus capsulatus mastoid involvement in a man of 70 years. Seventy years later he was operated upon on the other ide and the same organism was isolated from the mastoid pus. I would like to know if anyone else here has had a mastoid in a patient of this age.

Dr. Dench: I have had a patient of 70.

Dr. Lewis: I had one patient of 74; this was a capsulatus case.

Dislocation of the Stapes.

Dr. Dench: Reported a case in which during the radical operation the stapes was dislocated. No untoward symptoms followed except that, of course, the patient was totally deaf upon that side. Secondary grafting gave the patient a dry ear. As there was suppuration upon the opposite side, the patient was told that a similar accident might occur upon this side if operation were undertaken. The patient decided to take the risk, and a radical operation was performed upon the second ear, the primary graft being employed. The patient made a perfect recovery with improved hearing. The case was cited in answer to a report made by Dr. Richards at a previous meeting, at which time he (Dr. Richards) advised imme-

diate vestibular drainage in cases of accidental dislocation of the stapes. Dr. Dench's case proves that this is not necessary. Dr. Dench also mentioned other cases where the stapes had been dislocated without any meningeal infection.

Dr. Rae: We discussed this before at the otological society. I think dislocation of the stapes was common when doing ossiculectomy. Nobody realizes the danger of infection of the labyrinth. The stapes can be removed without fatal results.

Unusual Color of Tympanic Membrane.

Dr. D. P. Kerrison mentioned the case of an old lady who had been under his care for several years, the interesting point in whose case was the color of her right drum membrane—i. e., that of a good specimen of green jade. This color has not changed since he first saw the patient. Otherwise the drum membrane was fairly normal, or at least showed all the normal landmarks.

Dr. Dench: Was there any fluid in the middle ear?

Dr. Haskin: I saw a patient in Dr. Rae's clinic. There was chronic suppuration on one side. The other side the membrane was intact. It was dark blue. There was no fluid. It never changed in color.

Dr. Page: I have seen one such case in which the drum was a dark brown color. Argyrol had been used through a catheter. I incised the drum and it regained its normal color.

Metastatic Orchitis Following Removal of Ear Polyp.

Dr. McCullagh: In the case referred to, I do not know whether the symptoms were coincidental or secondary. The patient, a man, 65 years old, had a polyp in the middle ear. I removed a piece and the next day he had a metastatic orchitis. This condition came on 24 hours after removal of the polyp. Two weeks later the man developed labyrinthitis of the serous type. This was relieved by a radical mastoid operation.

Dr. Dench: I have seen a sinus thrombosis develop after such a procedure. The metastases might be in any part of the body. Was it a secondary mumps case?

Dr. McCullagh: No. There was no parotitis.

Psychic Deafness.

Dr. Harris: I would like to mention the case of a little girl presented at the last meeting. I made a tentative diagnosis of psychic deafness. We were contemplating lip reading instruction. She was sent to a neurologist. In the course of examination Dr. Hunt made the child talk and she heard and answered questions. This cleared up the diagnosis.

Granulation of the Auditory Canal.

Dr. Scruton: The case I mention was of a young man, a member of the Society for the Improvement of the Deaf. He was a K. of C. man. He had been deaf since childhood. After return from the army (where he was operated upon by an army surgeon) he heard normal spoken voice without difficulty until after operation for removal of a polypoid granulation in the canal. When he came

to me the granulation material had increased in size. After adrenalin and cocain were put in he could hear, but became deaf again. I thought of the Hopkins operation of widening the canal. I found that the granulations came from the anterior inferior quadrant. I put a curette into the middle ear without disturbing the ossicles to remove granulation. The boy cannot hear now, and the only thing to offer is a radical operation. Before the granulation was removed he could hear well. I believe I am justified in doing a radical.

Dr. Rae: Did he fail to hear after the operation? What does the functional test show now?

Dr. Scruton: He does not hear anything unless transmitted by bone. The Weber is not lateralized. I did not try the Galton. There is a considerable amount of moisture in the ear. The drum looks rather thick and beefy. I presume the manipulation created inflammation. The point is what operation should be advised. Is a radical safe?

Dr. Harris: When was the operation done?

Dr. Scruton: Within the last five weeks.

Dr. Bacon: Was there any odor to the discharge?

Dr. Scruton: No. I opened the mastoid and it was normal. The condition was confined to the middle ear.

Dr. Bacon: Is the conduction good on the other side?

Dr. Scruton: Yes.

Dr. Lewis: I would be inclined to wait awhile.

Dr. Harris: I should, too.

Dr. Duell: Has he bone conduction on both sides?

Dr. Scruton: Yes. That is apparently perfect. That is why I hope for results from a radical. The other ear was similar to this, but it has been dry for five years. I removed a polyp in that ear. I think the boy needs a radical.

Dr. Duell: Can the boy hear in an artificial tube?

Dr. Scruton: No. I may have stirred up these bones in some way or other.

Dr. Duell: I think it would be a good plan to let it alone.

Dr. Page: It seems to me that if the hearing is as bad as that, there must be something further in to get such deafness.

Dr. Kerrison referred to the case of a young woman he had seen in the wards of the Manhattan Eye and Ear Hospital. The left drum membrane was red and markedly bulging. The patient, however, showed the cardinal symptoms of a suppurative labyrinthitis, viz.: she was intensely dizzy; there was strong spontaneous nystagmus to the right; using a noise apparatus in the right ear, she was apparently absolutely deaf.

Acting on the physical signs of inflammation in the left drum membrane, this was incised, giving exit to pus apparently under pressure. This almost immediately was followed by relief of symptoms—i. e., hearing returned, and vertigo and nystagmus disappeared. This case, for which, he said, he could give no exact explanation, shows at least this fact: That we may have a condition within the middle ear in which the pressure of confined fluid will so act on the labyrinth as to cut off both the cochlear function and also that of the vestibular mechanism.

Dr. Scruton: I know of a case in which the man had been deaf from childhood up and had a discharging ear for a number of years. He had been to all the prominent otologists. Finally he went to one in Paris. He wrote to Paris to find out what had been done. One of the assistants of this doctor wrote back that the boy had been given almost perfect hearing by doing what he called "mobilization of the stapes." There may be something in that, but I have had no experience with it.

Dr. Kerrison: I never saw any permanent results from it. When adhesions form, the hearing is often worse.

Dr. Dench: We are talking about two different conditions: One suppurative, one serous. Serous fluid in the tympanic cavity will cause absolute deafness. It is not necessary to incise the drum membrane. Inflation will cause marvelous improvement.

Some patients have nystagmus during inflation. If you have fluid in the posterior portion of the tympanic cavity, changing the position of the fluid by moving the head will affect the hearing. This has been seen in a number of cases. In regard to mobilizing the stapes, I do not think there is much to that procedure except in cases after radical operation. With a vaseline pledget placed over the head of the stapes you can sometimes get improvement in hearing which is marvelous. I have seen hearing for the whisper increase from four feet before the insertion of the pledget to twenty feet after its use.

Dr. Garrison: I have seen serous otitis, but these cases are labyrinthitis.

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